TECHNOLOGY DEPARTMENT

ROADS AND STREETS

NOVEMBER 1948

HIGHWAY BRIDGES
AIRFIELDS
CONSTRUCTION

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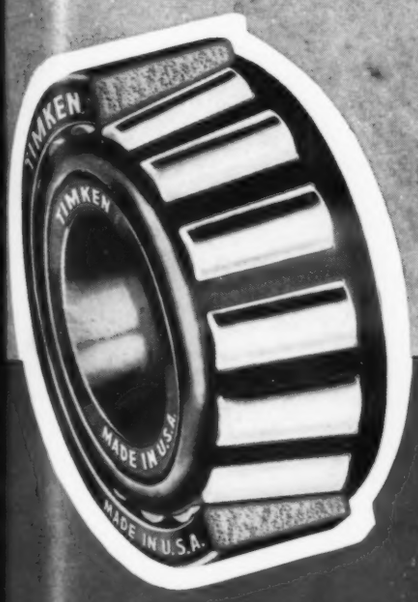


Photo courtesy Roto Wing Company, Shakopee, Minnesota.

How TIMKEN® BEARINGS Help Roto Wing Keep Winter Traffic Moving

Roto Wing is a combination mouldboard and rotary snow plow that clears the road from ditch to ditch, widening back snow banks at the rate of 100 miles of road per 10-hour day under normal snow conditions.

In operation, the snow is pushed up the mouldboard and into the rotor, which discharges it into the fields bordering the road at a speed of 60 miles an hour.

To keep the rotor whirling constantly at top speed with low power demand and minimum attention for lubrication and maintenance, it is mounted on Timken tapered roller bearings. Timken bearings have been used at this position ever since the Roto Wing was developed — nine years ago — and according to the Roto Wing Company's records, not a single Timken bearing has been replaced.

The photograph shows Roto Wing being used in conjunction with a "Caterpillar" No. 12 motor grader — also equipped with Timken bearings. No matter what kind of road building or maintenance equipment you buy, it will pay you to make sure it is Timken bearing equipped. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address, "TIMROSCO".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

IT A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←

NORTH • EAST • SOUTH • WEST • IT'S SCHRAMM!

so versatile, so easy to operate, so economical . . .

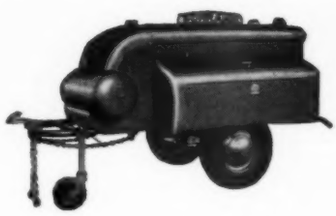
IT PAYS TO USE SCHRAMM!

VERSATILE . . . because Schramm can furnish air for any compressed air job in your work; and versatile because there is a size and model Schramm to fit your individual needs!

EASY TO OPERATE . . . merely by pushing a button to start, and compact and lightweight enabling you to move the portable units wherever you like! Meanwhile, the stationary units take up very little room, are vibrationless and no trouble!

ECONOMICAL . . . because Schramm can do *all* your compressed air jobs quickly and efficiently. Features that assure economy include 100% water cooled, forced feed lubrication, and mechanical intake valve.

Your field has found that Schramm Air Compressors well fit its needs. And has specified Schramm everywhere . . . North, East, South and West. Write today for full data.



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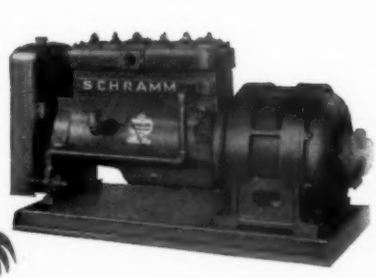
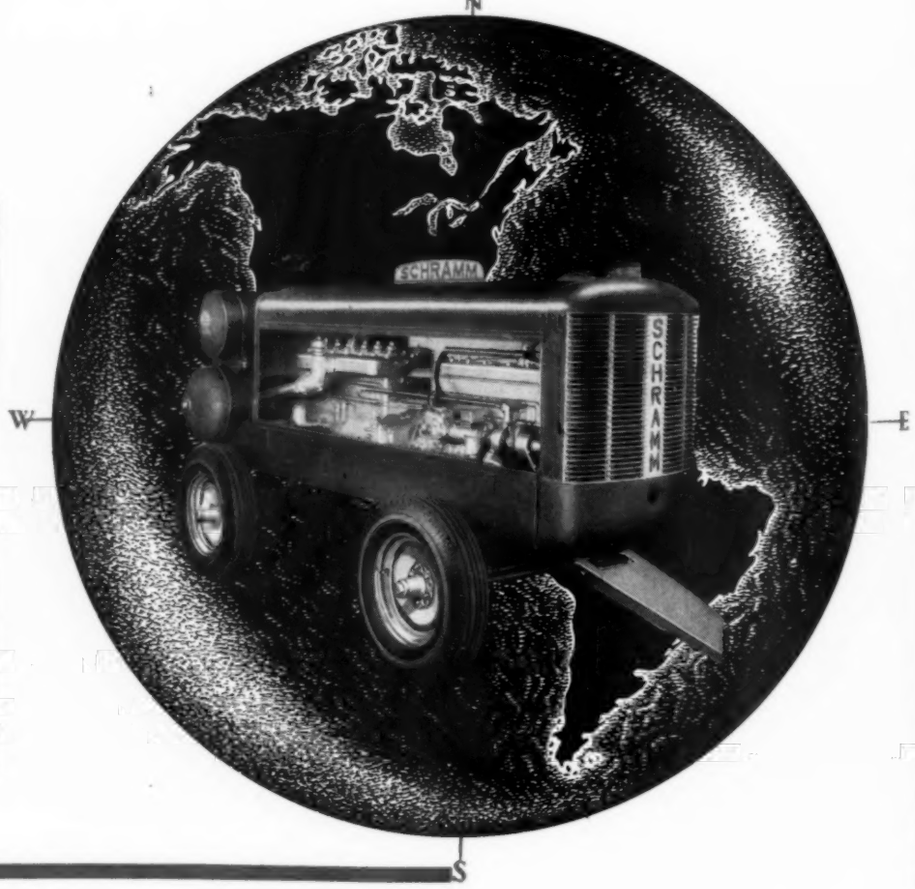


STATIONARY

SCHRAMM INC.

THE COMPRESSOR PEOPLE
WEST CHESTER
PENNSYLVANIA

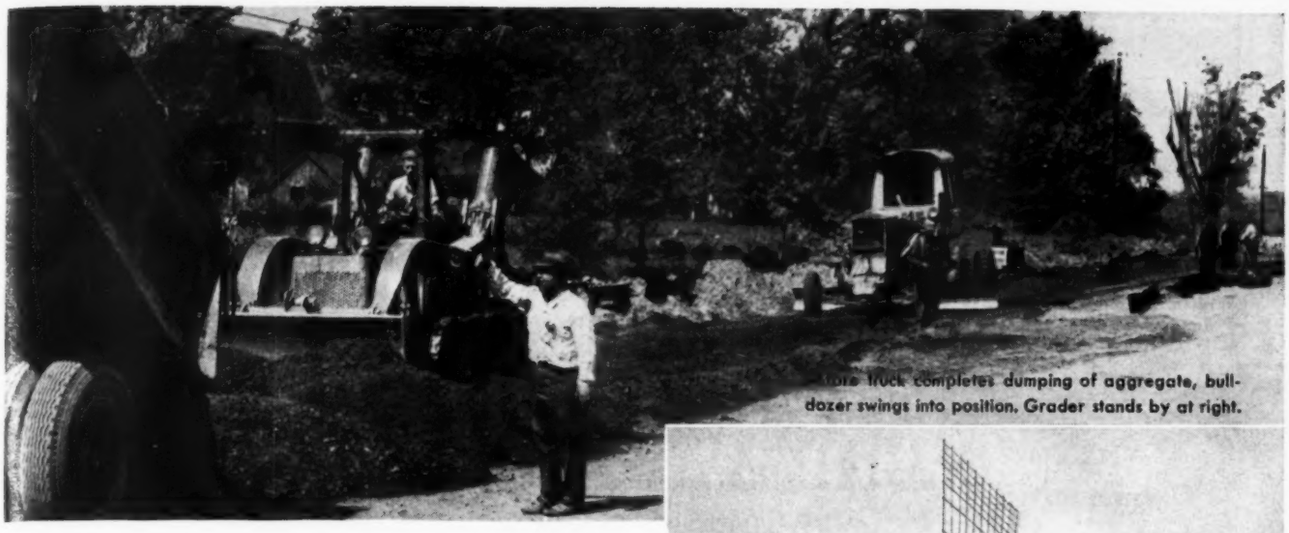


TOOLS *for the* JOB

Schramm Inc. also has a complete line of Pneumatic Tools to offer and recommend for operation by their Compressors.

These include Rock Drills, Paving Breakers, Trench Diggers, Clay Spades, Backfill Tampers, Tie Tampers, Sheeting Drivers, Demolition Tools, Chain and Circular Saws.

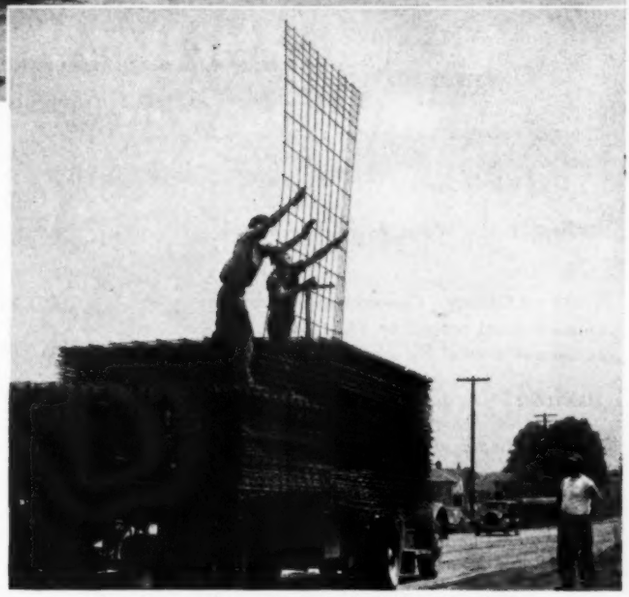
Write for bulletins and prices.



...truck completes dumping of aggregate, bull-dozer swings into position. Grader stands by at right.

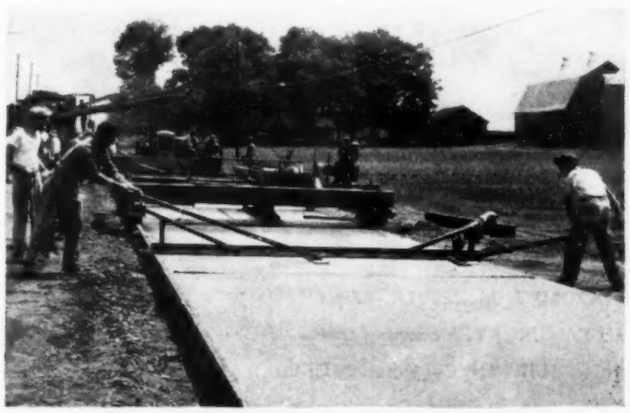
Highway Near Buffalo GETS GOING-OVER

Joseph Cerillo (left), contractor, and Gene Niland, Depew Paving Co. engineer, enjoy a hearty laugh.



One, two, and over it goes. Bethlehem Bar Mats are unloaded from truck, adjacent to new highway.

With rough grading completed, foreman checks accuracy of formsetters. Fine grading will soon be underway.



Working on heels of strike-off and finishing machines, hand finishers give new strip careful, last-minute check.

To cope with heavy traffic to and from the Buffalo area, nearly four miles of Route 20, east-west express route traversing mid-state New York, was recently rebuilt. These scenes were taken between Town Line and Alden, N. Y., and show various stages of the four-lane project. Contractor: Depew Paving Co., Depew, N. Y. More than 100,000 sq yd of bar mats were supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
Guard Rail Posts • Wire Rope and Strand • Pipe
Hollow Drill Steel • Spikes • Bolts and Nuts • Tie-Rods
Timber Bridge Hardware • Sheet and H-Piling
Fabricated Structural Steel

BETHLEHEM STEEL

ROADS AND STREETS

NOVEMBER, 1948 • VOL. 91 • No. 11

With Roads and Streets Have Been Combined Good Roads Magazine And Engineering & Contracting

In This Issue

Coming Articles

Contractor Performance. Look for a new series of articles on speedy scraper, rock and paving jobs of the '48 season.

Meetings. Public Works Association Boston notes.

Paving and Surfacing. Cement-treated base plus travel-plant project on West Coast . . . also several unusual hot-mix projects.

Stabilization. New data on Texas' use of lime.

Grading. Scraper loading data brought up to date.

Bridges. Open spandrel arch in Indiana, and attendant footing and forming headaches . . . Bridge details: photos from many states.

Metropolitan. A world-famous leader in parkway development will have something to say . . . More expressway progress reports: Pittsburgh, New York, Chicago, a Texas city; also "A Tale of 20 Cities."

County. Modern aggregate production, key to a county's stepped up road graveling and stabilization program.

Dams and Reclamation. This editorial subject (new to Roads and Streets; see "Dike in the Desert" in this issue) will be followed by report on Cherry Creek and other dams.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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2 BASEMENTS PER DAY with a TL-20 HOE

...speeds new housing project in Peoria, Illinois

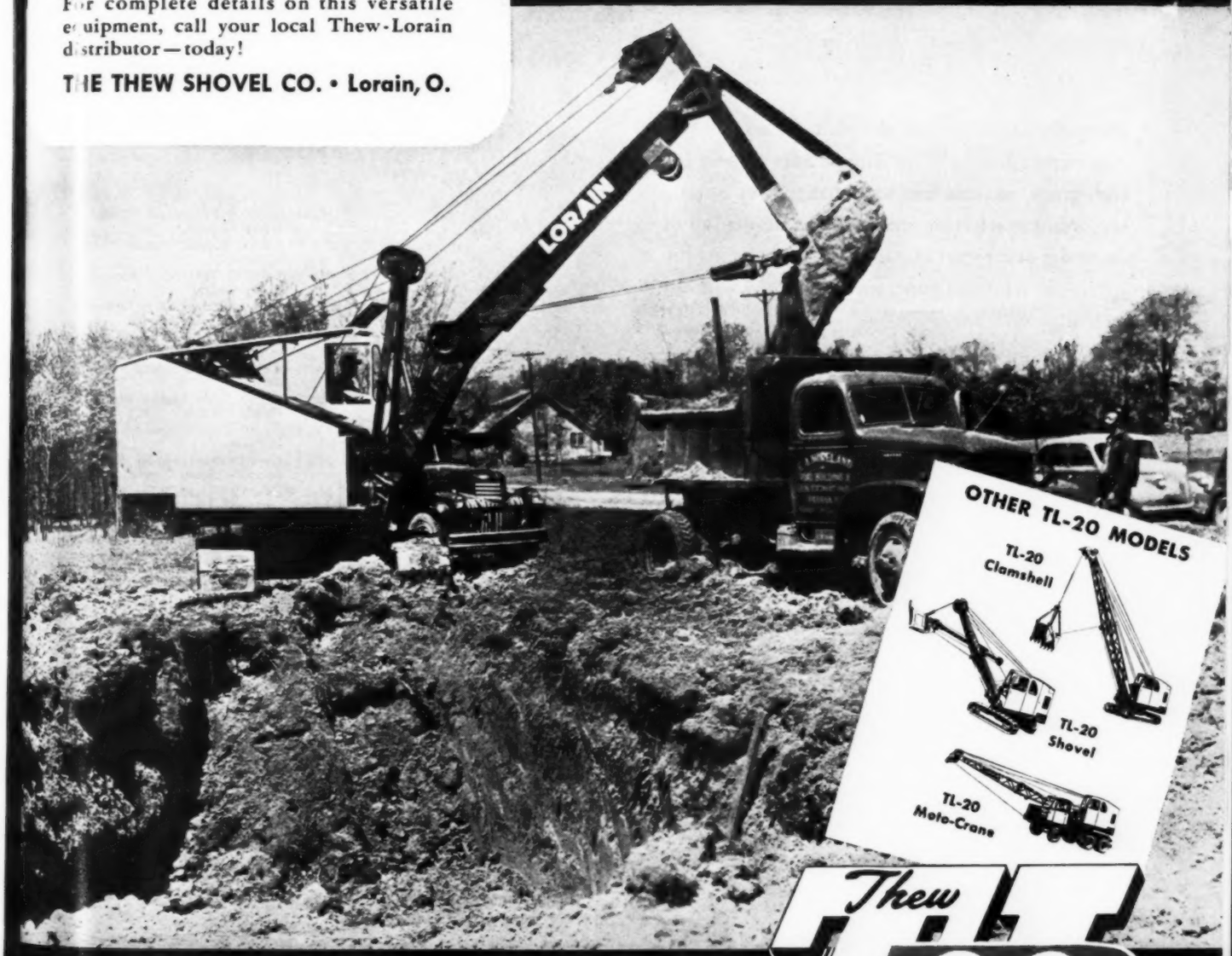
Mr. E. A. Moreland, General Contractor, Peoria, Illinois, is a staunch believer in efficient, profitable operation. When faced with the problem of digging 35 basements for a new housing project, Mr. Moreland moved a new ½ yd. TL-20 crawler-mounted hoe onto the job.

The contract was completed in record time. *All 35 basements in less than 18 days for an average of 2 basements per day*—totalling 6475 cubic yards!

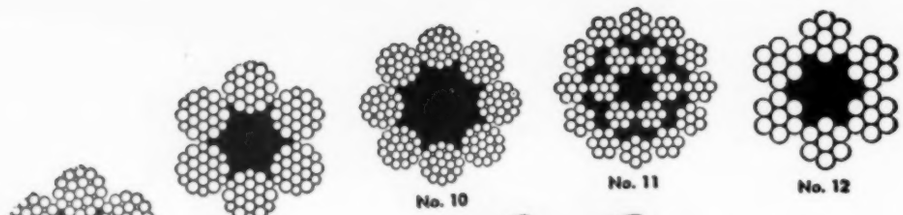
Says Contractor Moreland: "Our TL-20 has seen a lot of rough work. In six months our only repair was a replaced brake band – an easy job. It has given us wonderful performance with no upkeep cost."

You, too, can capitalize on the greater earning power of the TL-20. It is available with 5 booms and 10 different mountings that provide a total of 50 possible combinations to match your job conditions. For complete details on this versatile equipment, call your local Thew-Lorain distributor—today!

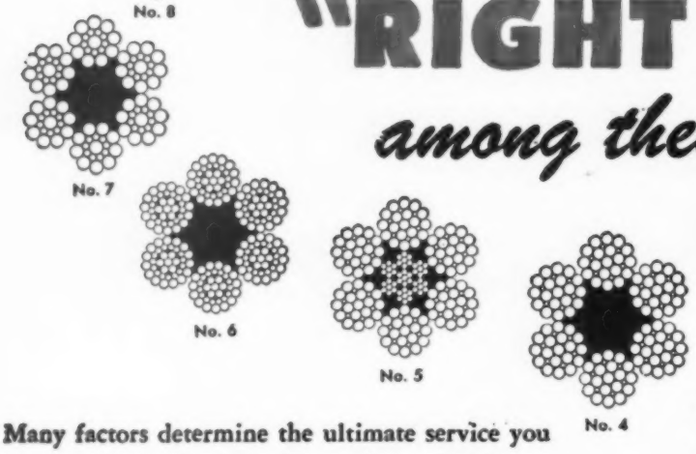
THE THEW SHOVEL CO. • Lorain, O.



Lorain Thew TL 20 Lorain



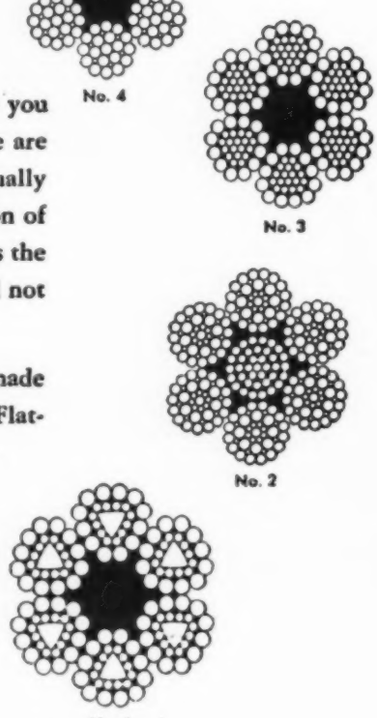
Is Your "RIGHT NUMBER" among these WIRE ROPE Constructions?



Many factors determine the ultimate service you may expect from a Wire Rope. Among these are size, grade, construction and quality. But equally important is selecting the correct combination of these and other vital factors. Unless a rope fits the particular job to be done, the best results will not be had.

As "HERCULES" (Red Strand) Wire Rope is made in a wide range of both Round Strand and Flattened Strand constructions—Preformed and Non-Preformed—it offers the 'right number' for *any* heavy duty job.

And our Engineering Department is always ready to help you select the rope that will give you the most service for each dollar of its cost. Call on us anytime.



No. 1—Style B Flattened Strand—Hemp Center
No. 2—6 x 41 Round Strand—Metallic Core
No. 3—Style G Flattened Strand—Hemp Center
No. 4—6 x 19 Filler Wire Round Strand—Hemp Center
No. 5—6 x 19 Filler Wire Round Strand—Wire Rope Center
No. 6—6 x 37 Round Strand—Hemp Center
No. 7—6 x 19 Seale Round Strand—Hemp Center
No. 8—6 x 19 Round Strand—Metallic Core
No. 9—6 x 19 Warrington Round Strand—Hemp Center
No. 10—8 x 19 Filler Wire Round Strand—Hemp Center
No. 11—18 x 7 Non-Rotating
No. 12—6 x 7 Round Strand Haulage Rope—Hemp Center.

All of these constructions are available either Preformed or Non-Preformed.

Use PREFORMED for Easier Handling and Smoother Spooling

"HERCULES" (RED STRAND) the DEPENDABLE WIRE ROPE for any TOUGH JOB
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Use PREFORMED for Longer Life and Greater Economy

MADE ONLY BY

A. LESCHEN & SONS ROPE CO.

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MAKE IT A REAL ROCK SHOVEL

for the heart of YOUR JOB!

ROCK DIGGING is the real test of any shovel. If you have a real Rock Shovel for your *Key Spots* you won't have to worry about output anywhere.

Your Northwest is a real Rock Shovel. It's designed as a Rock Shovel and it has advantages for *rock digging* that no other shovel has.

The Northwest welded boom design is based on extensive scientific tests, combined with the results of performance in the field, not on theory. The Northwest Dual Independent Crowd utilizes force other independent crowd shovels waste. Result:—it handles harder digging and more yards per hour. The Cushion Clutch reduces shock overloads to all parts under power, increasing cable and machine life. Uniform Pressure Swing Clutches take the jerks and grabs out of swinging and the "Feather-Touch" Clutch Control takes the back-breaking effort out of operation.

Plan now to have a Northwest in the *Key Spots*. Ask about these Northwest advantages. Find out why the Northwest is the Repeat Order Machine.

NORTHWEST ENGINEERING COMPANY
1504 Field Bldg., 135 South LaSalle St., Chicago 3, Ill.

NORTHWEST

SHOVELS • CRANES • DRAGLINES • PULLSHOVELS

Preformed . . .
THE NEW STANDARD
Those who use preformed wire rope do so because of its exceptional performance. Those who don't use it, should use it if only to make a comparison.
Those who use it know that
● it lasts longer
● is easier to install
● is safer to use
● and costs less to use

Paving Engineers can take a tip on

TEMPERATURE EXTREMES

from the DESERT NOMAD...

A hundred degree drop in four hours! Yet the desert nomad is comfortable without a change of clothes. His burnoose (that long, cape-like headdress) protects him under the burning heat of desert noon and the chill winds of desert night.

One dress for *two* extremes.

Do the same for concrete pavement. Choose *one* joint-sealing compound that protects at *both* extremes. Choose *Flintseal.**

You get all-'round, all-weather protection with this modern, rubber-bearing thermoplastic. Joint sealing that cuts maintenance costs to the bone because Flintseal lasts and lasts. Surety for a really big investment of public funds.

And Flintseal's quick and easy to use. Special equipment is now available for controlled heating and fast, efficient pouring.

You get more for your money with Flintseal. Four important advantages make this modern joint-sealing compound more efficient than ordinary fillers.

A view of a trailer-mounted heating device and special pouring pots on large concrete-paved airport.

1. Seals joints effectively against infiltration of moisture and other foreign matter.

2. Adheres firmly to concrete . . . without use of primers . . . extensible and compressible through repeated cycles of expansion and contraction of concrete slabs.

3. Maintains resilience . . . does not become brittle and crack in coldest weather, nor will it flow in hottest weather.

4. Can be melted and applied quickly and economically. Cools rapidly for early opening to traffic.

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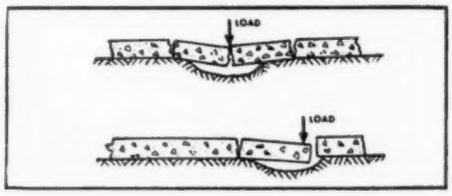

Here's what happens when pavement joints are not properly sealed against water infiltration to the subgrade.

Flintseal

HOT-POURED
JOINT-SEALING COMPOUND

For full details and application data on Flintseal, write today.

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Grading 11.8 miles of farm-to-market roads required moving 205,000 yards of earth. Here's a job that demanded dependable, productive earthmoving power. Chosen for the task—six International TD-18 Diesel Crawlers, one International ID-9 Diesel wheel tractor, two International-powered graders and an International-powered self-propelled scraper.

Here's another example of what contractors are discovering every day—it's wise to standardize on International Power. It pays off in lower operating and maintenance costs and in *more work done in a shorter time.*

Discuss your earthmoving problems with your International Industrial Power Distributor. He'll show you how International tractors and International-powered earthmoving equipment will put more profits in your pocket on any earthmoving job.

Industrial Power Division
INTERNATIONAL HARVESTER COMPANY
Chicago 1, Illinois

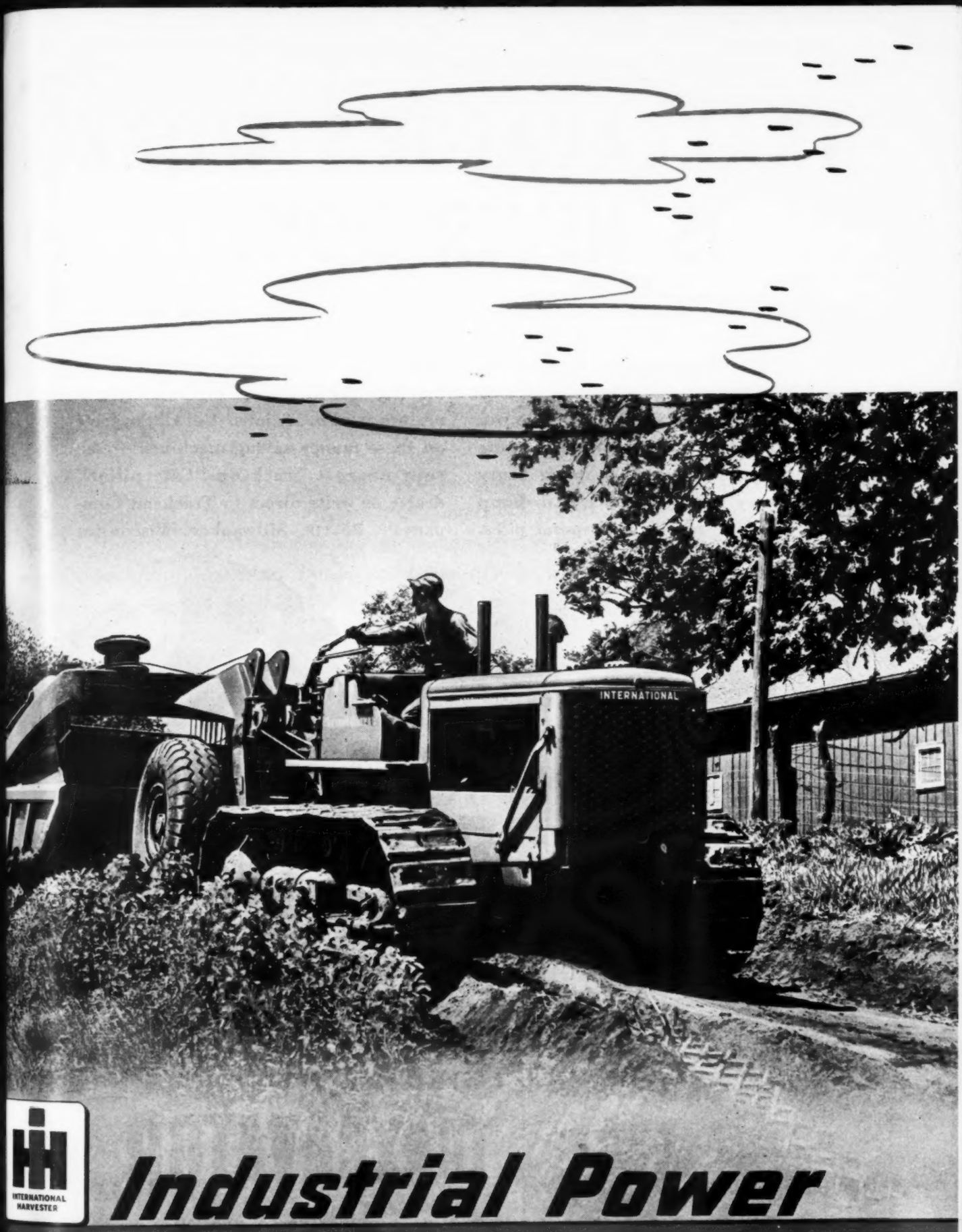
The International UD-18A engine is the power plant in the TD-18 Crawler. This dependable Diesel is one of a line of six Diesel and four carburetor-type International Power Units. Whatever your power and equipment needs may be, specify International engines for all your requirements. Productive International Power is the key to greater profits.

Tune in James Melton on "Harvest of Stars" CBS Wednesday evenings

CRAWLER TRACTORS
POWER UNITS
DIESEL ENGINES
WHEEL TRACTORS

INTERNATIONAL

INTERNATIONAL HARVESTER



INTERNATIONAL HARVESTER

Industrial Power

TRAXCAVATOR'S WORK IS NEVER DONE!

No matter what the season — there are always jobs for TRAXCAVATORS. In winter, it's snow removal — clearing snow-blocked streets, alleys, parkways and highways. TRAXCAVATORS give you the fast, smooth action you need to dig out hard-packed snow, scoop up heavy slush, carry it any distance and dump it into waiting trucks or disposal piles.

During the rest of the year these machines are constantly at work handling sanitary fills, digging up pavement, repairing streets, stockpiling and doing a multitude of other jobs. Get all the facts on these money-saving machines — see your nearest Trackson-"Caterpillar" dealer or write direct to Trackson Company, RS-118, Milwaukee, Wisconsin.

TRAXCAVATOR

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THE ORIGINAL TRACTOR EXCAVATOR

They all agree on "CATERPILLAR"!

It doesn't make much difference where they're located—whether they're in California or Illinois or a hundred other places—owners, users and public officials all get together on the subject of "Caterpillar" Diesel Motor Graders.

Here are some men whose work equips them to judge a product and its performance on-the-job. They still write the best ads.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

OWNER

EDWARD B. SAHLMAN of the Charles R. Smith pipeline trenching firm, Modesto, California: *"We use the 'Caterpillar' Diesel No. 12 Motor Grader to pull a cable plow along paved roads, and for backfilling trenches. Power and versatility are its best features. It's an A-1 machine!"*

STREET COMMISSIONER

R. K. SMITH, of El Cajon, California: *"This 'Caterpillar' Diesel Motor Grader has made great improvements on our city streets. In our low-cost paving program, the city furnishes the equipment and property owners buy the oil, the 212 does the rest!"*

OPERATOR

W. F. BAKER, Mid-America Engineering Corp., Skokie, Illinois: *"I wouldn't operate anything else. The 'Caterpillar' Diesel No. 12 Motor Grader is a good piece of machinery!"*

CATERPILLAR DIESEL ENGINES • TRACTORS • MOTOR GRADERS
EARTHMOVING EQUIPMENT

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Compare LaPLANT-CHOATE MOTOR SCRAPERS with crawler tractor rigs . . .

It means higher production capacity and increased profit potential!

Compare before you buy any earthmoving equipment. Compare original price—weight—mobility—speed—power—and production. On every point you will see why LaPlant-Choate Motor Scrapers produce more yardage at the lowest possible cost. Then you will know why more and more contractors are switching to LPC Motor Scrapers. Best of all — you can get prompt delivery, too.

Now is the time to get ahead of your competition—change to rubber-tired scraper hauling units. See your nearest LPC distributor and let him show you why the Motor Scraper is tomorrow's tool for today's job.

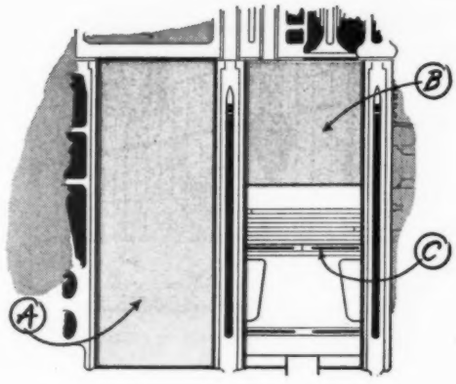
LaPlant-Choate Manufacturing Co., Inc.
Cedar Rapids, Iowa
1022 77th Ave., Oakland, Calif.

COMPARE	LPC MOTOR SCRAPERS	TRACK TYPE UNITS
Production yards per hr. 1,000′ one-way haul	156 yards	50% less
Capacity struck yards	14	the same
H.P. per struck yd. capacity	16	42% less
Weight	42,500 lbs.	50% higher
Weight per h.p.	189 lbs.	170% higher
Speed	18 m.p.h.	73% slower
Horsepower	225	42% less
Price per h.p.	$119	64% higher
Price	$26,750	only 6% less

LaPLANT-CHOATE

HIGH SPEED EARTHMOVING EQUIPMENT

CASE D119E—REDUCING WEAR ON LINERS IN DIESEL ENGINES



DIESEL ENGINE LINERS AND PISTON

In high-speed Diesel engines lubricated with RPM DELO Diesel Engine Lubricating Oil, wear on liners was held to a minimum with little variation over their entire areas. A constant lubricating film was maintained on them even in high-temperature belts. RPM DELO Oils are recommended for all types of Diesels. Come in all viscosity grades necessary for your engines.

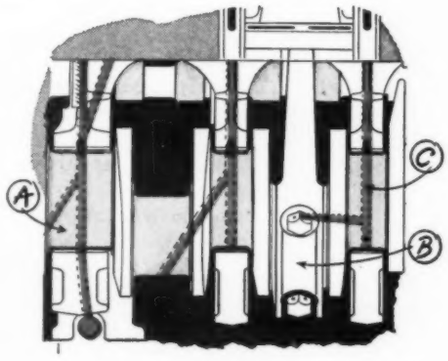
A. Special additive provides metal-adhesion qualities...keeps oil on all parts whether hot or cold, running or idle.

B. An anti-oxident resists formation of lacquer—resistance to extreme heat provides lubrication in the toughest conditions.

C. Contains detergent which keeps rings clean and operating freely...prevents scratching and gouging of liners.

RPM DELO Diesel Oil will not corrode any bearing.

CASE D119F—PROLONGING THE LIVES OF BEARINGS IN DIESELS



SECTION OF DIESEL ENGINE CRANK AND CAM

No bearing failures occurred between overhaul periods in Diesel engines used in the toughest service when they were lubricated with RPM DELO Diesel Engine Lubricating Oil.

A. Non-corrosive to all types of bearing metal...inherent ability of base stocks and added compound resist oxidation and formation of acid which is common cause of bearing corrosion.

B. Maintains a tough lubricating film which withstands excessive shocks and pressures.

C. Special detergent compound keeps oil passages clean and open - allows free flow of lubricant to vital points.

Another compound in RPM DELO Oil prevents foaming of the oil. An accurate measurement of crankcase levels can always be obtained.

For additional information and the name of your nearest Distributor, write

STANDARD OIL COMPANY OF CALIFORNIA

225 Bush Street, San Francisco 20, California

The California Oil Company
Barber, New Jersey

The California Company
17th and Stout Streets, Denver 1, Colo.

Standard Oil Company of Texas
El Paso, Texas

DIESEL ENGINE RPM DELO LUBRICATING OIL

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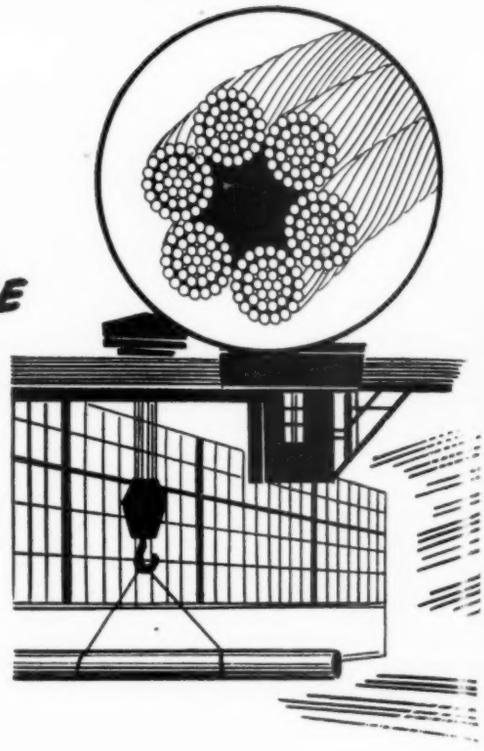
SOME ROPES FOOL YOU

U-W 6x37 WIRE ROPE WITH HEMP CENTER IS EXCELLENT FOR FACTORY CRANES BECAUSE IT IS FLEXIBLE AND RESISTS BENDING FATIGUE



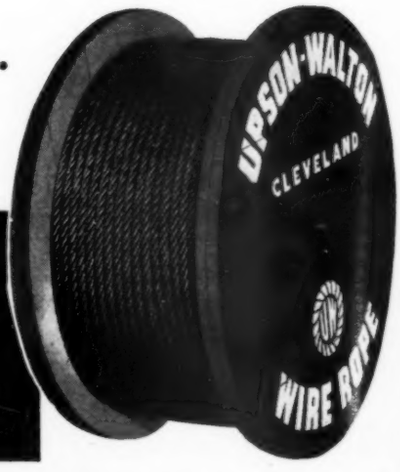
BUT...

FOR HOT LADLE CRANES U-W 6x37 I.W.R.C. ROPE IS BETTER BECAUSE THE METALLIC CENTER RESISTS INTENSE HEAT

For longest and best service, always specify
U-W LAYRITE (*Preformed*) IMPROVED PLOW STEEL

UPSON-WALTON IS THE ONLY MANUFACTURER OF ALL 4...
Wire Rope, Tackle Blocks, Wire Rope Fittings, Brattice Cloth.
We invite you to let us engineer your problem jobs.

Copyright 1948—The Upson-Walton Company



THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks, Brattice Cloth

Main Offices and Factory: Cleveland 13, Ohio

114 Broad Street, New York 4 | 3525 West Grand Ave., Chicago 51 | 241 Oliver Building, Pittsburgh 22

NO OTHER STANDARD PAVER COULD DO THIS JOB!

Here's a typical example of how Ransome Blue Brute versatility pays off when you're up against out-of-the-ordinary conditions. With the "live" boom-and-bucket you don't have to split batches. Instead, you discharge the complete batch into the bucket and run out the bucket to wherever needed. Then, with positive hydraulic control, you open the bucket doors *just enough to discharge the required amount!*

You can see how this patented Ransome feature eliminates costly accessories and extra labor — *and it's standard equipment only on Blue Brute Pavers!*

Many other advantages show why 34E Single or Dual Drum Pavers do *more* jobs — faster, better, for less cost. Your own jobs — paving or non-paving — will benefit by Ransome's famous mixing action, accurate water-measuring, all-weather batchmeter and foolproof, self-cleaning, fast-charging skip.

Get the whole story on Blue Brute Pavers from your nearby Worthington-Ransome Distributor, or write for Bulletin 208. RB-6

HERE ARE THE FACTS

The Holland Construction Company's Ransome Blue Brute 34E Dual Drum Paver pouring concrete for the Country Club Bayou storm sewer in Houston, Texas. Because of the distance and depth involved, a special "elephant's trunk" funnel is used.

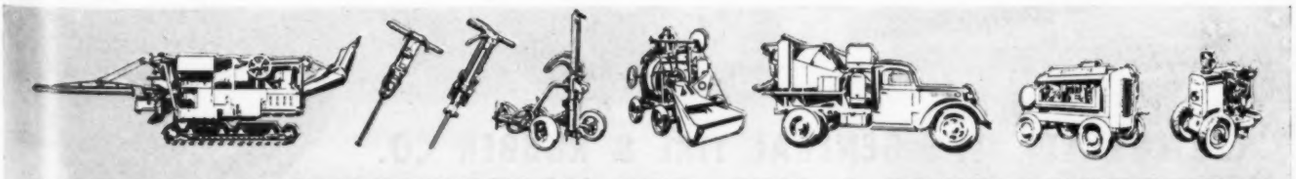
Only Blue Brute's exclusive, hydraulically operated "live" boom-and-bucket, plus its long reach, permit completely controlled pouring at any rate and any angle — a vital necessity on jobs like this, with hard-to-get-at forms!

Reports from similar types of jobs state that savings effected by this exclusive Ransome feature exceed $100 daily — by eliminating an extra 1½ yd. crane, crane operator and up to 4 additional men.

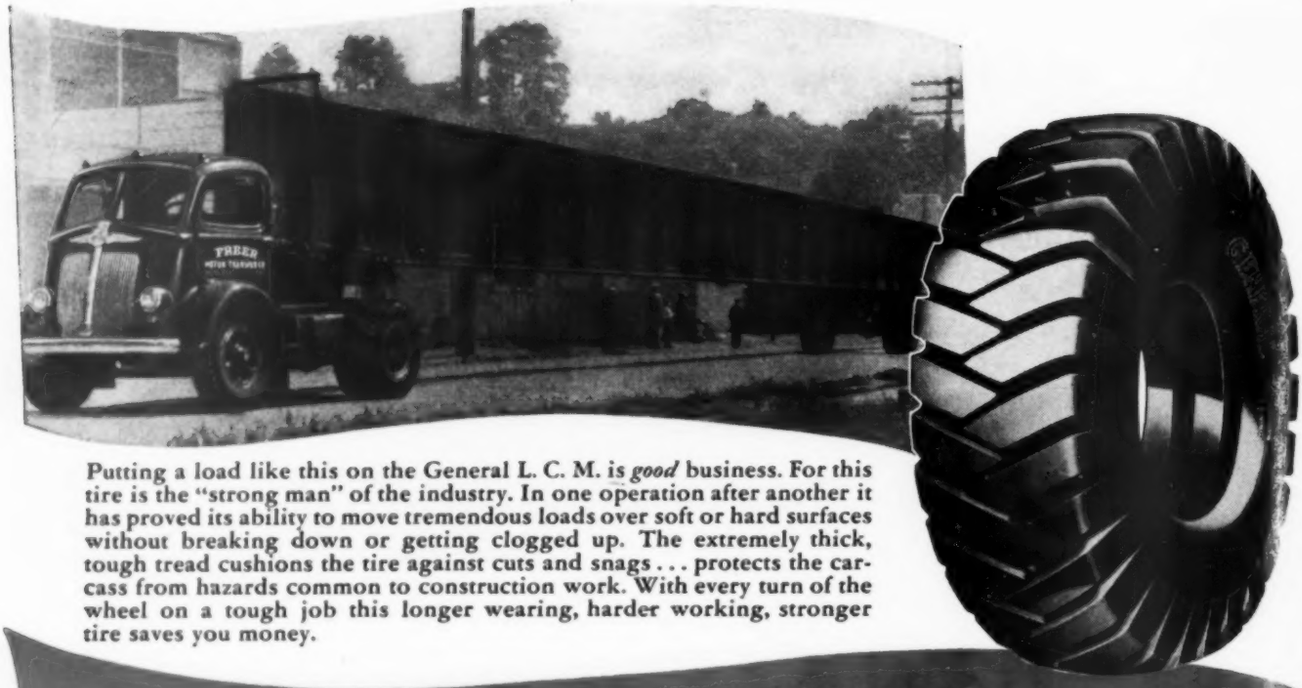
WORTHINGTON

WORTHINGTON PUMP AND MACHINERY CORPORATION
Worthington-Ransome Construction Equipment Division, Holyoke, Mass.
Distributors In All Principal Cities

BUY BLUE BRUTES



IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB



Putting a load like this on the General L. C. M. is *good* business. For this tire is the "strong man" of the industry. In one operation after another it has proved its ability to move tremendous loads over soft or hard surfaces without breaking down or getting clogged up. The extremely thick, tough tread cushions the tire against cuts and snags . . . protects the carcass from hazards common to construction work. With every turn of the wheel on a tough job this longer wearing, harder working, stronger tire saves you money.

To move loads and equipment *Faster and at Lower Cost*...have your General Tire dealer specify, install and service the tires for the job!

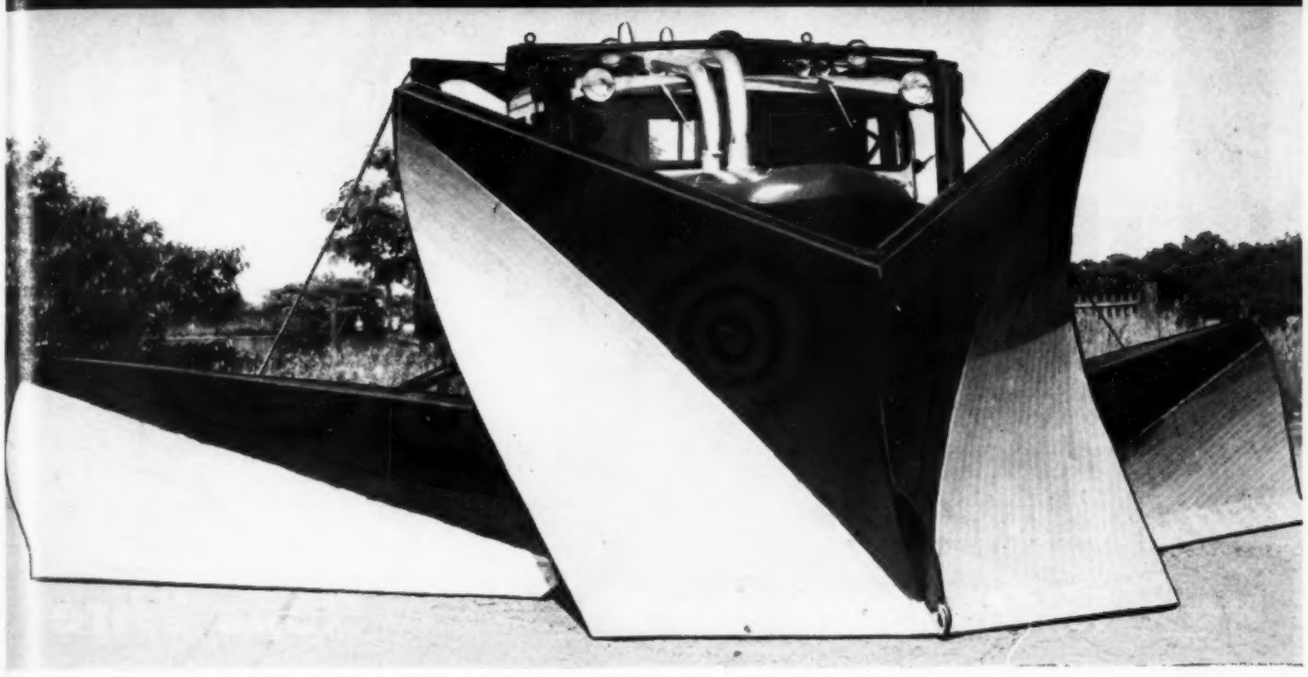
Specialists in any field do a better job. That's why this combination of power wheel tires and rolling wheel tires, designed specially for tractor graders, save time and money. The big, low pressure tractor grader tire rides high in sticky going . . . rolls easily through mud, sand or gravel . . . cleans and grips forward or backward . . . withstands rocks, ruts and ridges. For front or trailing wheels of regular, or leaning wheel type graders the free rolling, tapered continuous ribs of the ribbed grader tire resists side slip, makes steering easy.

The GENERAL TRUCK TIRE

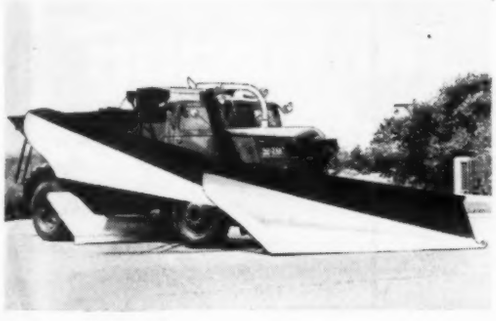
THE GENERAL TIRE & RUBBER CO.

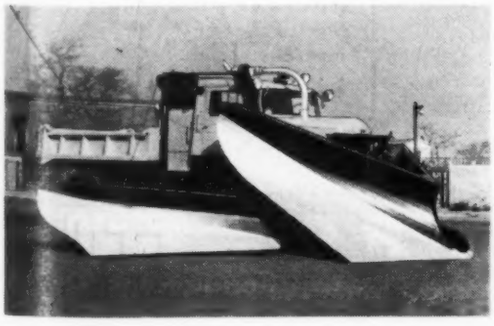
AKRON, OHIO

TRUCK and PLOWS *designed as a* TEAM!



—another reason why WALTER SNOW FIGHTERS *clear snow faster!*





Powerful Walter Snow Fighters permit mounting bigger plows, wings and blades of greater capacity and faster, more efficient clearing action than any other equipment.

Specially designed to take full advantage of the great traction of Walter Snow Fighters, the Walter V front plows, offset V plows and speed plows supply high arc and correct lifting and throwing action to hurl snow far off the road, yet provide proper drivers' vision. Hydraulically controlled side wings fan out snow to give remarkable dispersion. Less snow remains to be re-handled. A greater volume of snow is removed on each run and more miles cleared per hour.

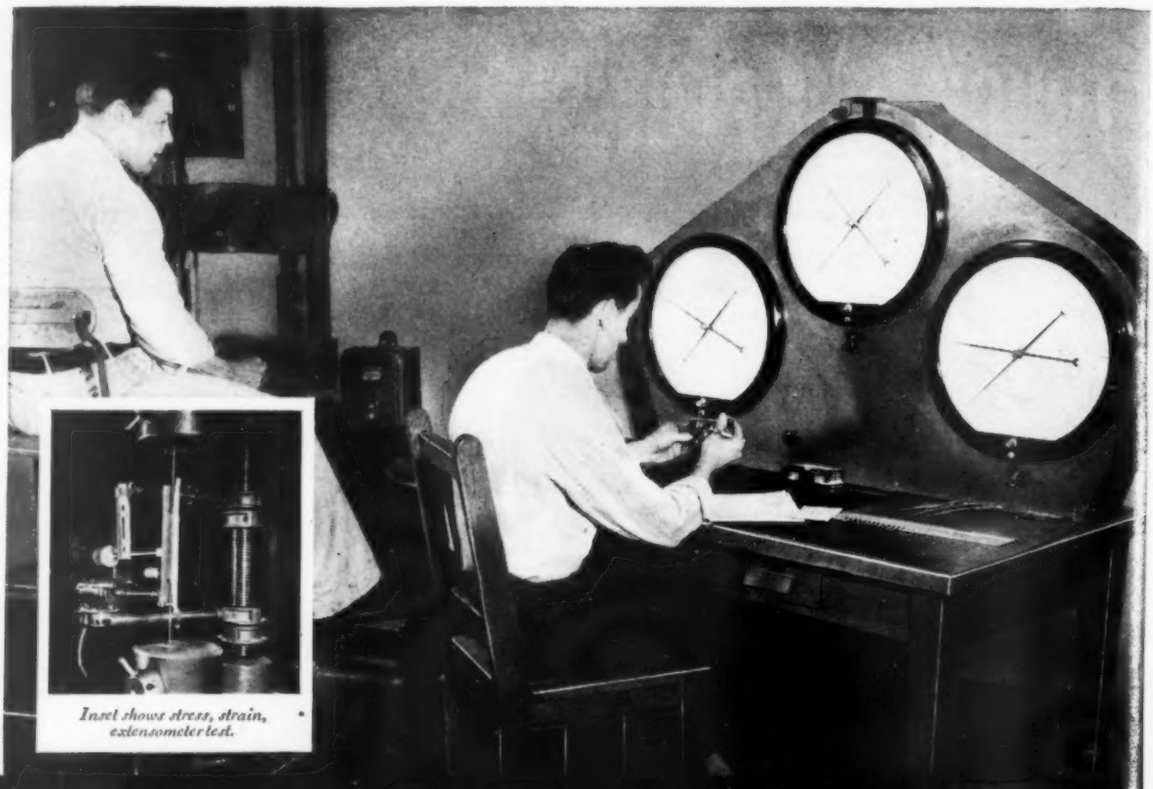
Only Walter Snow Fighters, with the superior traction of the Four-Point Positive Drive, can provide the great pushing power and speed to effectively use these high-capacity plows, as well as the Walter pressure center scraper blade.

See your distributor for full details on Walter Snow Fighters—or write us for literature.

WALTER MOTOR TRUCK CO.

1001-19 Irving Ave.
Ridgewood 27, Queens, L. I., N. Y.

WALTER SNOW FIGHTERS



Inset shows stress, strain, extensometer test.

How to Measure the Muscle in Rope Wire

Measuring the muscle—or tensile strength—of rope is one of many important tests used in grading Wickwire Rope. And the engineers who supervise these tests are tough taskmasters.

Before they release a single coil of wire to the Rope Mill, they take two samples from each end of every coil. These samples are gauged for size and roundness. Then the wire is subjected to the extensometer test, the tensile, torsion and elongation tests. Tolerances are even more exacting than those established by the industry; any wire not meeting the standards is rejected. Colored tags listing size, strength and other data are affixed to acceptable coils. These tags stay on the coils until they are made into wire rope—and the data they contain is kept on file for future reference.

This meticulous adherence to standards characterizes every phase of Wickwire Rope fabrication. Coupled with the services of Wickwire Distributors and Rope Engineers in specifying the rope with the right kind of muscle to do your hoisting or hauling job, it is your assurance of the utmost in performance, safety and long rope life. Wickwire Rope is available in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed. Next time you order wire rope make it Wickwire Rope. After checking its performance we feel certain that you'll keep on ordering it.

THIS 82-PAGE BOOK ON WIRE ROPE IS FREE. WRITE FOR YOUR COPY TODAY!

Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write—Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

WICKWIRE ROPE

CF&I & SUBSIDIARIES

A PRODUCT OF THE WICKWIRE SPENCER STEEL DIVISION OF THE COLORADO FUEL AND IRON CORPORATION

WIRE ROPE SALES OFFICE AND PLANT—Palmer, Mass. **EXECUTIVE OFFICE**—500 Fifth Avenue, New York 18, N. Y.

SALES OFFICES—Abilene (Tex.) • Boston • Buffalo • Chattanooga • Chicago • Denver • Detroit • Emlenton (Pa.) • Fort Worth • Houston • New York • Philadelphia • Tulsa

PACIFIC COAST SUBSIDIARY—The California Wire Cloth Corporation, Oakland 6, California

"Job-Rated" TO FIT THE JOB

Trucks that *fit your job* . . . save you money. They save in many ways.

They save on gas, oil, and tires. They save on upkeep and repairs. They stay on the job. They last longer.

For such a truck, see your Dodge dealer. Tell him what you haul . . . the weight of your load . . . and your operating conditions.

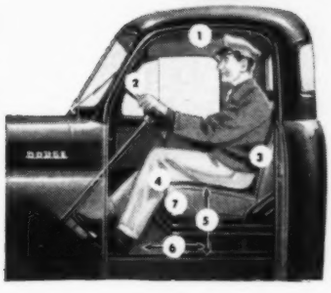
He will then recommend a Dodge *"Job-Rated"* truck that has been engineered and built to fit *your* job.

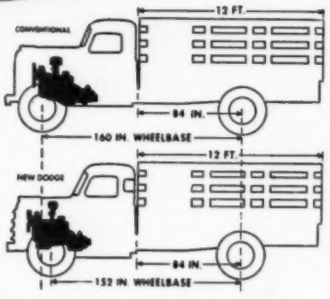
Your new truck will have *"Job-Rated"* power, for performance with economy.

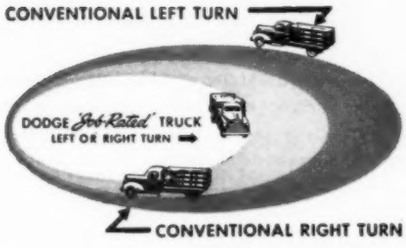
Every other unit . . . clutch, transmission, brakes, rear axle, springs and tires will be *"Job-Rated"* for long life and dependable operation.

For the location of the Dodge dealer in your community, consult the yellow pages of your telephone book.

PLUS... these important NEW features







SHORTER TURNING DIAMETERS

New Dodge *"Job-Rated"* trucks provide an entirely new ease of steering and handling. You can turn in much smaller circles, right and left, because of a new type of "cross-steering," plus shorter wheelbases and wider tread front axles.

MORE COMFORT AND SAFETY

1. Plenty of headroom. **2.** Steering wheel, right where you want it! **3.** Natural back support, adjustable for maximum comfort. **4.** Proper leg support. **5.** Chair-height seats. **6.** 7-inch seat adjustment, with convenient hand control. **7.** "Air-O-Ride" cushions, adjustable to weight of driver and road conditions.

BETTER WEIGHT DISTRIBUTION

New Dodge *"Job-Rated"* trucks have *much* better weight distribution. You can haul *more payload*. This has been achieved by moving the front axle back, *under* the frame, and moving the engine forward. More of the load is carried on the front axle. Wheelbases are shorter . . . but cab-to-rear-axle dimensions are unchanged.

DODGE "Job-Rated" TRUCKS

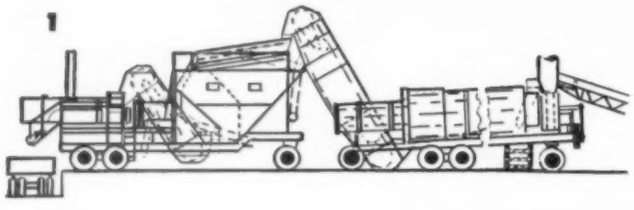
FIT THE JOB . . . LAST LONGER !

Visit the Big Dodge "Job-Rated" Truck and Equipment Show, Madison Square Garden, New York City, November 18-21, 1948

Continuflo Asphalt Plant

WITH ONLY 2 MAIN UNITS

1



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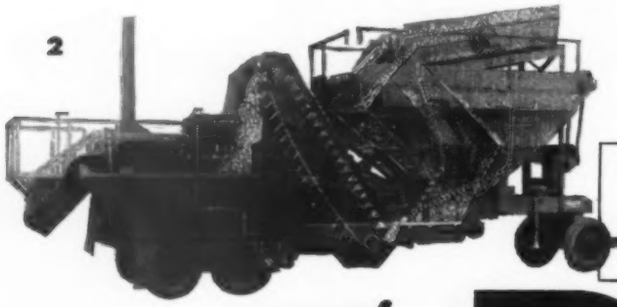


THE NEW *Continuflo* Central Mix Asphalt Plant brings you the most portable and compact continuous process asphalt plant ever built. It is recognized as one of the great developments in asphalt equipment.

Consisting of only 2 main units—the mixer and the drier—*Continuflo* is easier to move . . . easier to locate on the job.

In *Continuflo*, all mixing operations are fully automatic. The asphalt metering pump is interlocked with the aggregate feeder to provide correct proportioning of bitumen and aggregate. There is no variation in the finished product. The human element is out—the correct mix is assured!

Write for complete information about *Continuflo*—the year's outstanding development in asphalt equipment.

PIONEER ENGINEERING WORKS
1515 CENTRAL AVENUE • MINNEAPOLIS 13, MINNESOTA

1 ***IN A STEADY, CONTINUOUS FLOW*** aggregate passes from the feeder conveyor through the drier, hot elevator and gradation unit to the pugmill.

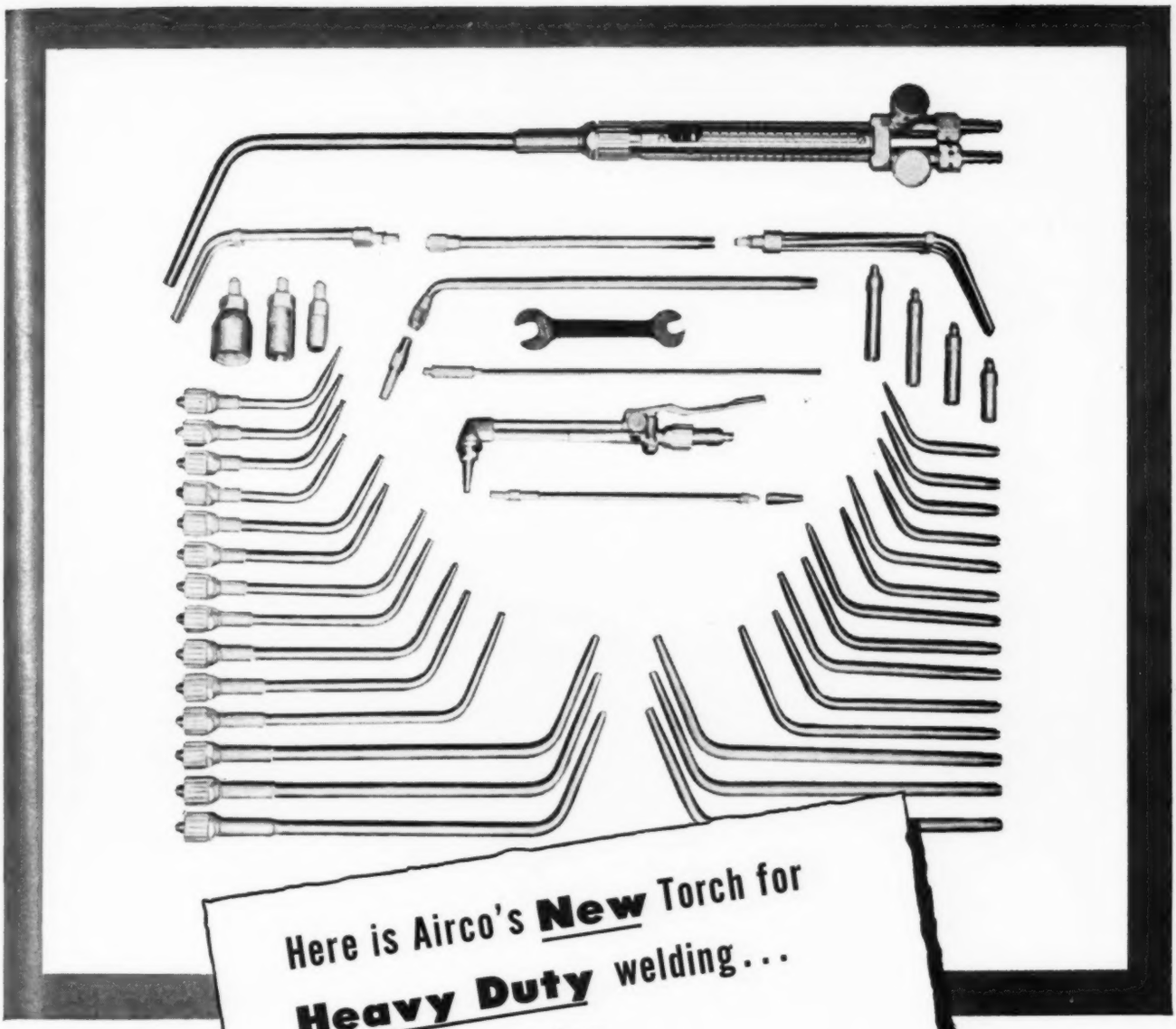
2 ***A COMPACT PLANT***—Gradation and Mixing Unit combines on one truck the gradation screen, proportioning unit, transfer elevator and mixer.

BUY BOTH!

Higher Output, Lower Upkeep!

Pioneer

Continuflo **EQUIPMENT**



Here is Airco's **New** Torch for **Heavy Duty** welding... heating... brazing

The new Airco 800 Torch is designed for tough, *heavy-duty* jobs. As shown in the illustration, the torch operates with a complete range of welding tips (with or without individual mixers) as well as heating, brazing and a variety of tips for other uses. No other torch can offer this wide operating range.

The torch head is of durable, long-wearing monel metal; thus fewer torch head replacements, and lower maintenance costs result. The general design of the new Airco 800, plus flexible 1/4" or 5/16" I.D. hose, assures perfect balance and ease of manipulation . . . lowered operator fatigue.

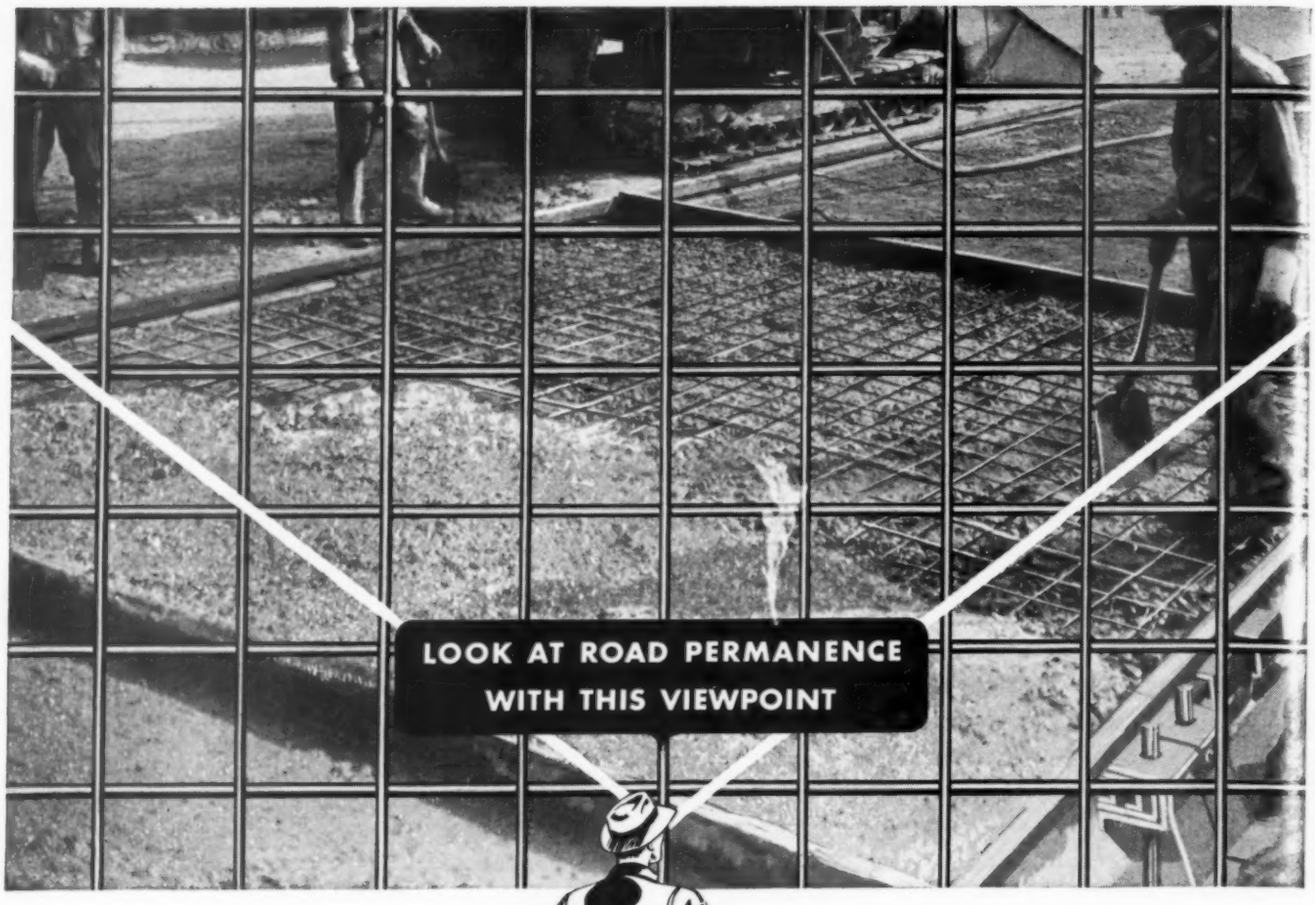
With the addition of a cutting attachment, the Airco 800 is easily converted to handle general shop cutting work.

If you would like more information about this torch, or a FREE demonstration right in your own shop, address Dept. -8471, Air Reduction, 60 East 42nd Street, New York 17, N. Y. In Texas: Magnolia Airco Gas Products Company, Houston 1, Texas. On West Coast: Air Reduction Pacific Company, San Francisco 4, California.

AIRCO **AIR REDUCTION**

Offices in All Principal Cities

Headquarters for Oxygen, Acetylene and Other Gases . . . Carbide . . . Gas Welding and Cutting Machines, Apparatus and Supplies . . . Arc Welders, Electrodes and Accessories



Truscon Welded Steel Fabric Helps Build the BEST ROADS!

Safeguard public funds in the highways which you plan . . . assure long-lived, full-value highway construction . . . by depending upon Truscon Steel Fabric for road protection.

Here's what Truscon Welded Steel Fabric assures:

Provides resistance to cracking due to shrinkage of concrete during setting period.

Provides tensile strength necessary to resist subgrade friction.

Provides increased resistance to cracking in concrete slabs, which has been created by the expansion and contraction of subgrades.

Provides increased resistance to cracking of concrete due to load.

Prevents the development of microscopic cracks into visible cracks.

Prevents cracks from opening and allowing entrance of water.

Prevents broken ends of slabs from separating at a crack.

Decreases spalling and progressive breakage.

All these, and other advantages, will help build more wear-life into public highways with Truscon Welded Steel Fabric Reinforcement and associated roadbuilding products.

TRUSCON
Steel Company

SUBSIDIARY OF REPUBLIC STEEL CORPORATION • YOUNGSTOWN 1, OHIO

ECONOMICAL AIR

wherever you need it

For highway, bridge, dam, or building construction — *wherever* compressed air is needed — a CP Portable Compressor meets air demands *most economically*.

Fuel consumption is held to a minimum because the engine speed keeps exact pace with air demands, thanks to the CP gradual speed regulator. This and other CP features effect fuel savings of 15% to 35%.

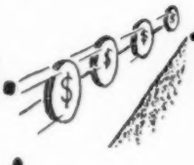
On the CP-500 Diesel-driven compressor illustrated, the six-cylinder Caterpillar D-13000 engine and the V-8 arrangement of compressor cylinders are further features that make for smooth, economical performance.

CP Portable Compressors are available in gasoline-driven models of 60, 105, 160, 210 and 315 c.f.m., actual capacity, and in Diesel-driven models of 105, 160, 210, 315 and 500 c.f.m. Write for full information.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

AIR COMPRESSORS • ELECTRIC TOOLS • PNEUMATIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

Plan now to make Asphalt resurfacing a major part of your 1949 road program. Here's why: it's the fastest and easiest way to rebuild worn and broken surfaces. For city streets, 4-lane highways, or farm-to-market roads, there are economical types of Asphalt construction that will give you the most miles of smooth-riding, easily maintained roads for your highway dollars.  To get unvarying top quality and a reliable supply use...

STANDARD OIL ASPHALT

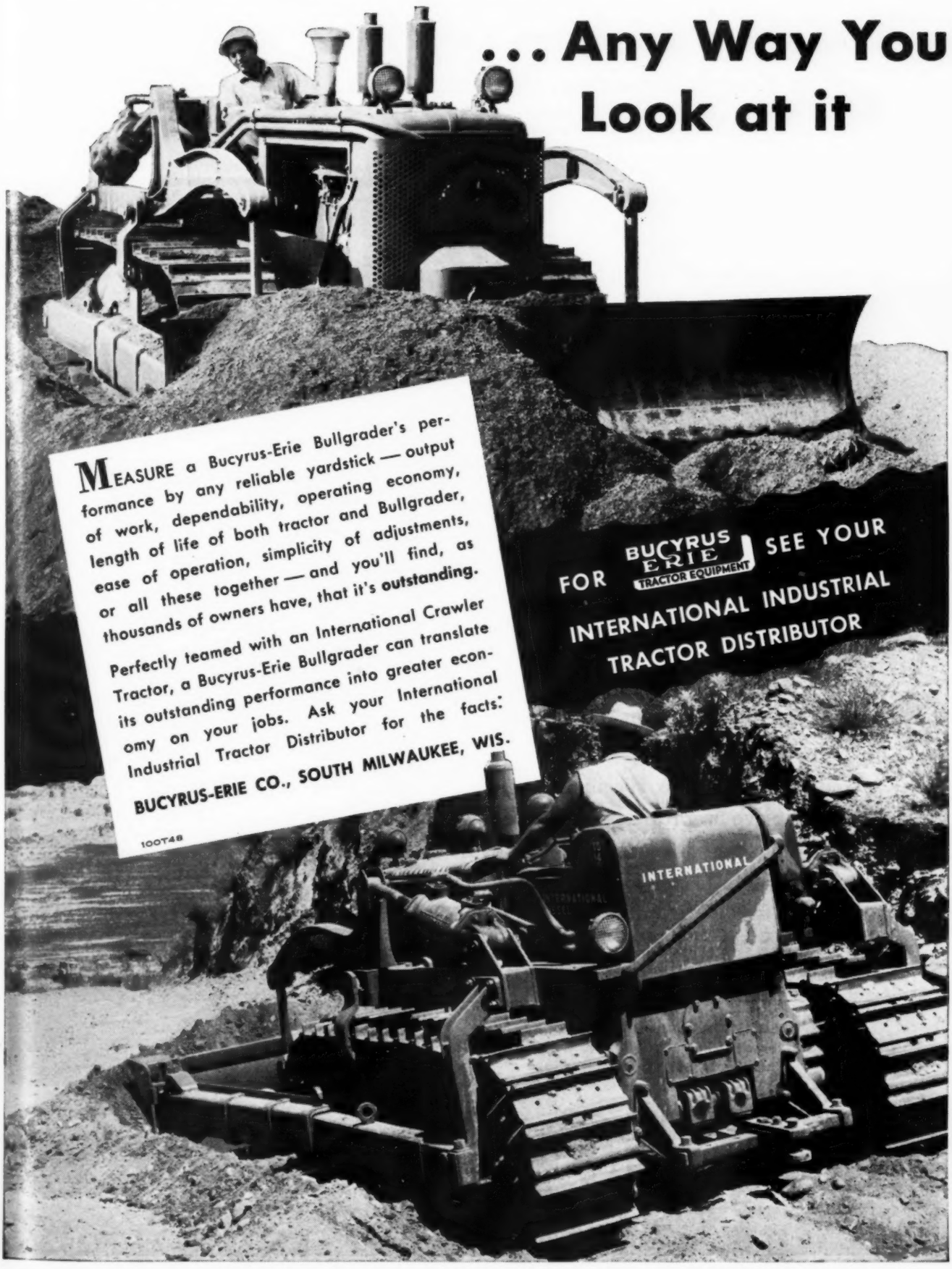
Our Asphalt Representatives are located throughout the Midwest to help you on any phase of your Asphalt work—from planning to delivery. Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY (INDIANA)

STANDARD

OUTSTANDING

... Any Way You Look at it



MEASURE a Bucyrus-Erie Bullgrader's performance by any reliable yardstick — output of work, dependability, operating economy, length of life of both tractor and Bullgrader, ease of operation, simplicity of adjustments, or all these together — and you'll find, as thousands of owners have, that it's **outstanding.**

Perfectly teamed with an International Crawler Tractor, a Bucyrus-Erie Bullgrader can translate its outstanding performance into greater economy on your jobs. Ask your International Industrial Tractor Distributor for the facts:

BUCYRUS-ERIE CO., SOUTH MILWAUKEE, WIS.

100T48

FOR BUCYRUS ERIE TRACTOR EQUIPMENT SEE YOUR INTERNATIONAL INDUSTRIAL TRACTOR DISTRIBUTOR

BROS *Sno-Flyr*

SLASHES INVESTMENTS NEEDED
in Trucks, Blades, Plows,
Graders and Labor

This fast, powerful *Bros* Sno-Flyr has made fleets of snow removal equipment obsolete . . . armies of men old-fashioned.

And by so doing, it has *cut the financial investment needed* and *greatly reduced the cost per foot* of snow removal.

Reason: The *Bros* Sno-Flyr is as fast and powerful as an army of men. It cuts a 14-foot swath at speeds up to 25 miles per hour . . . it keeps up with the storm . . . moves easily through the toughest banks.

It does a complete job in one pass . . . as easily and smoothly as a reaper cutting grain . . . faster, more efficiently than a fleet of ordinary snow removal equipment.

And it reduces truck maintenance and fuel consumption up to 75% by eliminating plunging and bucking.

Write for complete specifications and free descriptive literature . . . find out how the Sno-Flyr can cut *your* snow removal costs by doing a better job faster.

WM. BROS BOILER AND MANUFACTURING CO.
Minneapolis 14, Minnesota

EXPORT DIVISION: Knickerbocker Export Co.
50 Broad Street, NEW YORK 4, N. Y.
CABLE ADDRESS: "KNICKMIXER"

BROS *Sno-Flyr*

THE WORLD'S FASTEST, MOST POWERFUL ROTARY SNOW PLOW

LINK-BELT SPEEDER *Shovel-Cranes*

K-370—K-375

PRECISION-BUILT, POWER PACKED

TO DO MORE WORK

Easier, Faster!

A full load, a fast swing and more swings per hour, add up to greater output and more profitable operation.

INDEPENDENT RAPID BOOM HOIST,

permits raising or lowering of boom while travelling, swinging or hoisting, adds to maneuverability and speed of handling.

POSITIVE CHAIN CROWD,

controlled by same wrist-action lever as Rerack unit gives operator one-hand control of crowding and retracting of dipper.

SPEED-O-MATIC HYDRAULIC CONTROLS

eliminate lost motion and back-lash, giving greater speed, abolishing operator fatigue.

•

Let your distributor help you select a Link-Belt Speeder shovel-crane to suit your exact need, from the 25 models, crawler or wheel-mounted, all convertible to every front end attachment.

Excavating, steel erecting, materials handling, (or what have you?) you'll find a Link-Belt Speeder Shovel-Crane will help you do it faster, at lower cost, and at greater profit.

Sound engineering skill results in precision-built machines for trouble-free operation and long life service. For heavy duty, 1¾ yard capacity applications, models K-370 and K-375 combine high capacity, rugged strength with great ease of handling and economical operation.

11.301

LINK-BELT SPEEDER

LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS IOWA

Builders of the Most Complete Line of **SHOVELS-CRANES-DRAGLINES**

MINNEAPOLIS MOLINE
MM
MODERN MACHINERY

INDUSTRIAL WHEELERS *Cut* HANDLING COSTS

Roll back loading costs with the new UTIL Shuttle Wheeler! A new shuttle gear gives 6 reverse speeds at 85% of the 6 forward speeds (1.8 to 14.5 m. p. h.). Since loader operation is 50% forward and 50% reverse travel, UTIL *fast reverse speeds* and *quick change* from forward to reverse gear cut time on every load!

MM Roller Spin Steering permits steering wheel to roll easy with capacity loads. Heavy-duty front-end 10,000 lb. tire capacity and engineered design *minimizes road shock* and operator fatigue.

See Your MM Dealer-Distributor or Write

MM INDUSTRIAL POWER UNITS for hoists, electric generators, rock crushers, pumps, compressors, cranes, shovels, and many other industrial uses give excellent performance and economy . . *proved* adaptability!

- *High-turbulence combustion chamber!*
- *Controlled cooling!*
- *Exclusive MM Heat Exchanger Base Pan!*
- *Oil pressure and water temperature safety cutouts!*
- *Removable cylinder heads and blocks!*

From 25 to 230 h.p.

MINNEAPOLIS-MOLINE
POWER IMPLEMENT COMPANY
MINNEAPOLIS 1, MINNESOTA

WHAT THOSE HIGHWAYS NEED IS A
"SPRAY MASTER"
ON THE JOB

"Spray Master" Distributors are designed for low cost, efficient Road Building and Maintenance. Operating time is cut to a minimum. With a 24 ft. Vacuum Flow Full Circulating Spray Bar asphalt, tar, emulsion or road oil can be sprayed with razor like precision. *No gadgets to mess with* either, the "Spray Master" *has one valve* for starting and stopping the spray. Manual operating individual nozzles can reduce the spraying width in a few seconds. Low cost and efficient operation is the watchword of the Littleford "Spray Master." The Faster Heating System, Hydraulic Spray Bar Adjustment, Circulating by Vacuum not pressure, Heat Chamber, are only a few of the advantages the "Spray Master" gives as standard equipment. Made in sizes from 800 to 3000 gal. truck mounted or frameless semi-trailer. For Better Roads use the best equipment, the "Spray Master" Distributor. Write for Bulletin No. 14.

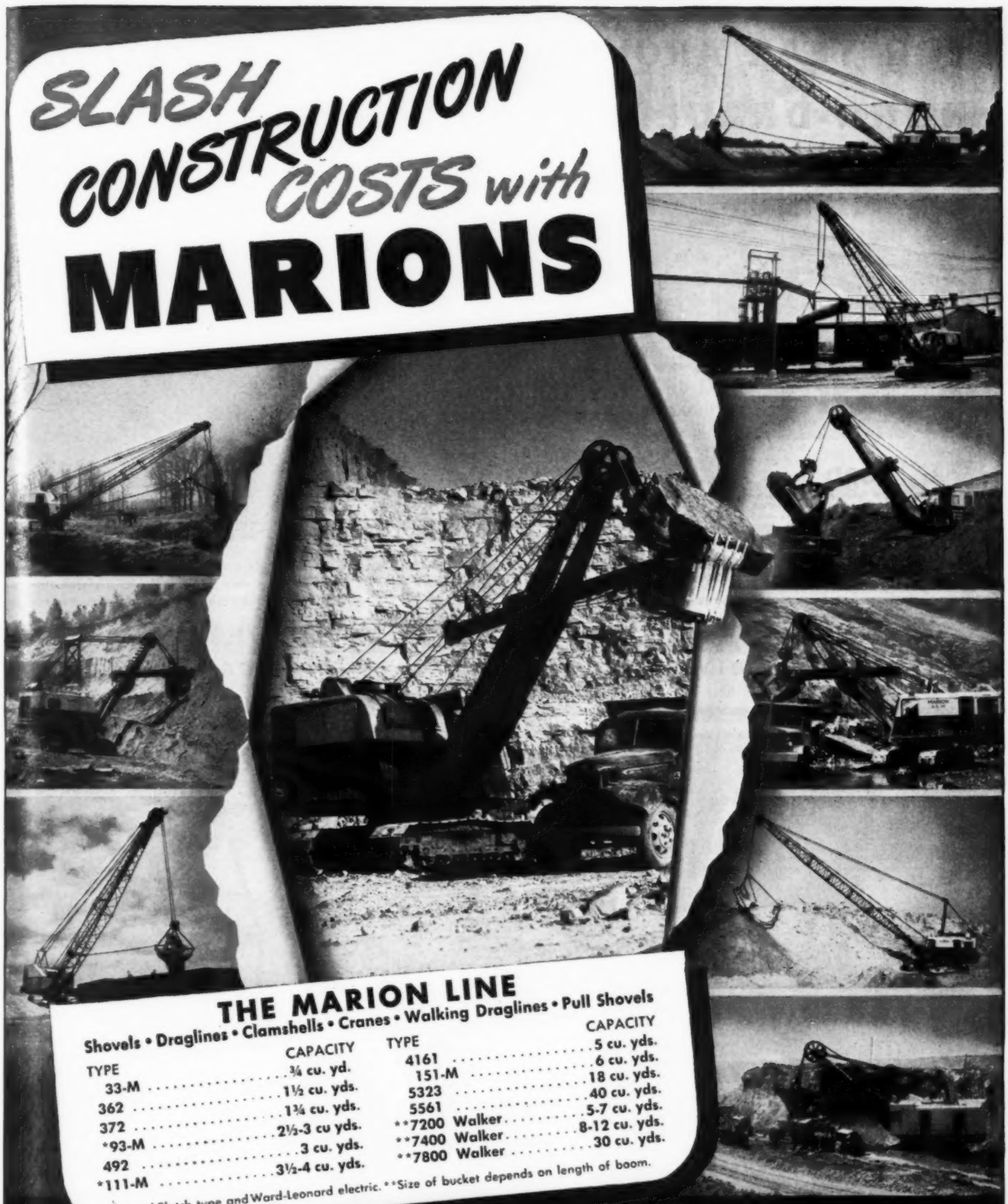
MANUFACTURERS OF
"Spray Master" Pressure Distributors

"Tankar" Steam Heaters	Highway Brooms	Asphalt Supply Tanks
"Kwik-Melter" Roofers Kettles	Tool Heaters	No. 101 Utility Spray Tanks
Trail-O-Rollers	Trail-O-Distributors	84-HD Asphalt Kettles

BLACK TOP ROAD MAINTENANCE EQUIPMENT
LB
SINCE - 1900

LITTLEFORD
LITTLEFORD BROS., INC.
454 E. Pearl St., Cincinnati 2, Ohio

SLASH CONSTRUCTION COSTS with MARIONS



THE MARION LINE

Shovels • Draglines • Clamshells • Cranes • Walking Draglines • Pull Shovels

TYPE	CAPACITY
33-M	¾ cu. yd.
362	1½ cu. yds.
372	1¾ cu. yds.
*93-M	2½-3 cu yds.
492	3 cu. yds.
*111-M	3½-4 cu. yds.
4161	5 cu. yds.
151-M	6 cu. yds.
5323	18 cu. yds.
5561	40 cu. yds.
**7200 Walker	5-7 cu. yds.
**7400 Walker	8-12 cu. yds.
**7800 Walker	30 cu. yds.

*Diesel Clutch type and Ward-Leonard electric. **Size of bucket depends on length of boom.

From 3/4 Cu. Yd. POWER SHOVEL COMPANY MARION SINCE 1884 To 40 Cu. Yds.

MARION

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MARION, OHIO, U. S. A.

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FOR YEAR AROUND TRACTOR OPERATION
WITH
HORN-DRAULIC INDUSTRIAL LOADERS

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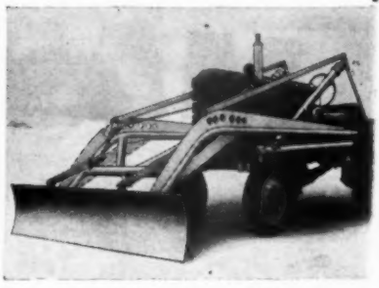
A TWIN CYLINDER HYDRAULIC LOADER DESIGNED FOR SERVICE



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Streamlined and compact the Horn-Draulic Industrial Loader performs the year 'round leveling, filling and leveling job with ease. Let your small equipment do double duty.

CASE VAI

The twin cylinder operation lifts 1,690 pounds with ease. Easily installed and maintained. A sturdy, balanced unit of proven design.

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Engineered to distribute the load over the Loader frame. Tractor does not carry the strain. Check this labor saving, time saving loader today!

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Williams Type
Welded Buckets

Operators prefer the Wellman Bucket for its balance, easy handling, and digging power. Owners prefer the Wellman Bucket for its bigger payloads, lower maintenance cost. These features are not accidental. Wellman pioneered in welded construction of rolled steels which make these buckets lighter, stronger, for greater yardage at lower costs. In all types and sizes, you'll do better with a Wellman!

There's a Wellman Bucket for every service

THE WELLMAN ENGINEERING COMPANY
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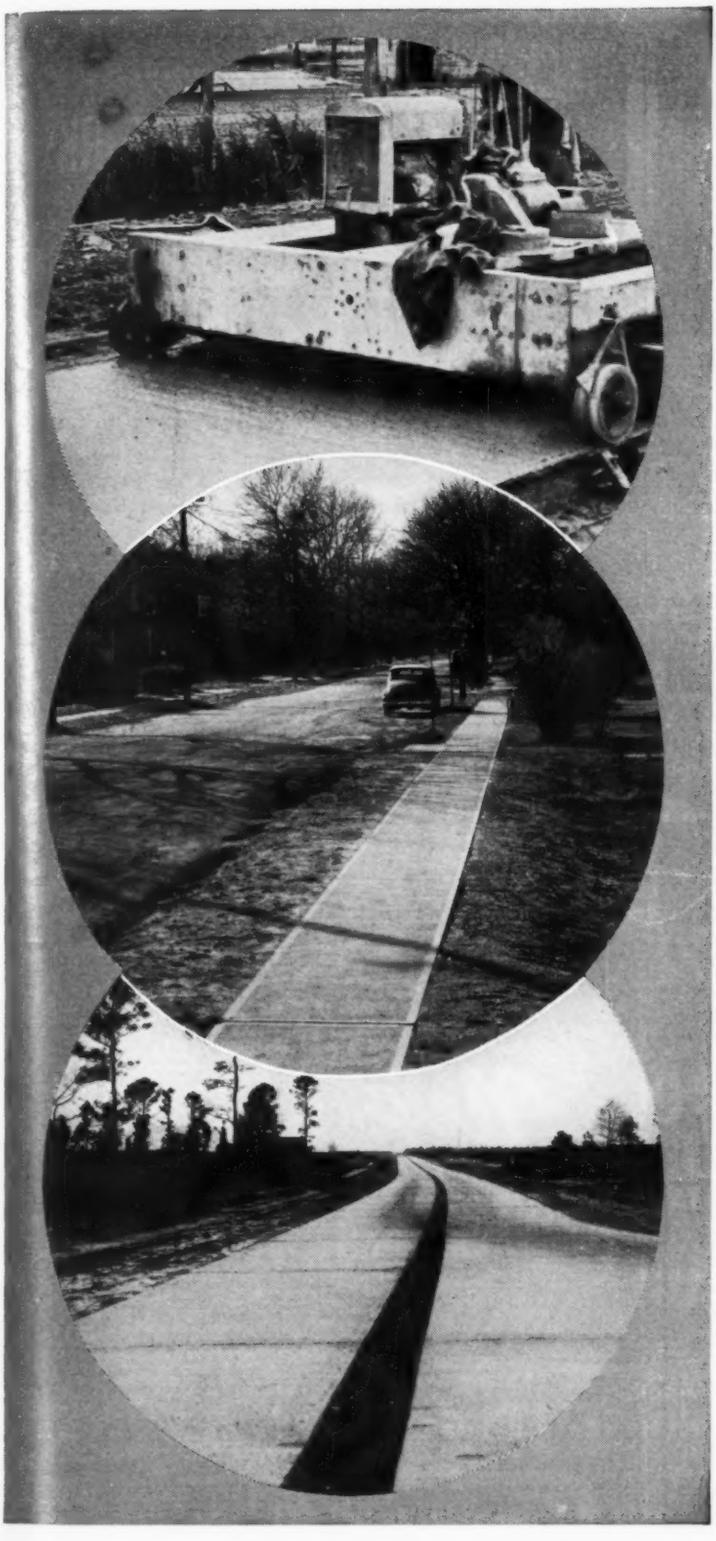

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makes a more durable concrete

Numerous field installations of concrete made with Atlas Duraplastic Air-Entraining Cement offer convincing proof of its resistance to the effects of freezing-thawing weather and the scaling action of de-icing salts. Less mixing water is required for a given slump of concrete made with Duraplastic cement, yet it is more plastic, more cohesive . . . segregation and bleeding are reduced.

Requires no new methods or materials

Usual placing procedure is unchanged . . . just the same workmanship and careful supervision regularly employed. Significant is the fact that in addition to its outstanding performance in paving and heavy construction, many contractors are utilizing the advantages of Duraplastic concrete for smaller jobs such as sidewalks, alleys, steps, areaways and retaining walls.

And it costs the same as regular cement

At no extra cost, Duraplastic provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance.

Duraplastic conforms with ASTM and Federal specifications. Write for further information to Universal Atlas Cement Company (United States Steel Corporation Subsidiary,) Chrysler Building, New York 17, N. Y.

OFFICES: Albany, Birmingham, Boston, Chicago, Cleveland, Dayton, Des Moines, Duluth, Kansas City, Minneapolis, New York, Philadelphia, Pittsburgh, St. Louis, Waco

RS-D-74

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TRADE MARK REG. U. A. C. CO.

AIR-ENTRAINING PORTLAND CEMENT

MAKES BETTER CONCRETE AT NO EXTRA COST

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ALL-DIESEL OPERATION PAYS FAUZIO BROTHERS

DIESELECTRIC PLANTS deliver years of service at low cost

Coal stripping is rugged—and dusty. Equipment with the stamina to "take it" will perform as successfully on your projects. Mr. Frank Fauzio, of Fauzio Bros., widely-known coal stripping and hauling contractors of Nesquehoning, Pa., writes: "We have used WITTE Dieselectric Plants on a number of our shovels since 1938. We do not hesitate to recommend your units for operation on shovels. They are economical and fit in very nicely with our operations as all our shovels are Diesel-powered."

WITTE DIESELECTRIC PLANTS

Mr. Fauzio further states their Dieselectric Plants show savings records up to $125.00 yearly, per unit, eliminate fire hazard and "have been very cheap for us both from repairs and fuel consumption. They are the best small Diesels that we have used in our business." Use WITTE Dieselectric Plants—have an all-Diesel operation. Write us today.

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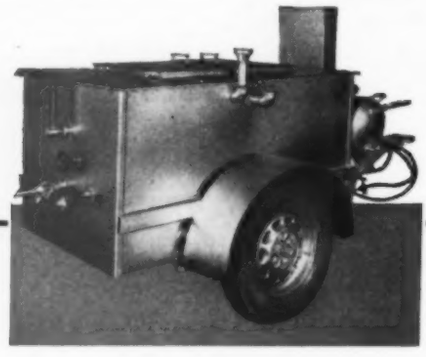

White Oil Jacketed Kettles for Heating Elastic Joint Filler

Joint filling compounds containing rubber, for elasticity, must have indirect heat application. They melt at 375° and must not exceed 425°. White Model F-10 kettles maintain this temperature accurately by an oil jacket which transfers heat to the compound.

White kerosene burners are safe and dependable, easily controlled. Hand operated agitator. Insulated housing.

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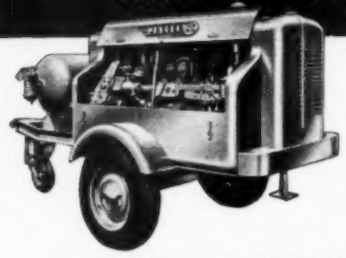
THAN 105 FT. MACHINES



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yet costs no more and uses no more fuel when not delivering more air

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Jaeger's "new standards" are 75 cfm instead of 60 — 185 cfm instead of 160 — 250 cfm instead of 210 — 365 cfm instead of 315 — 600 cfm instead of 500 — to match the requirements of today's air tools, run more tools at full pressure and efficiency, do 30% to 40% more work for the same money. See your Jaeger distributor or get new Catalog JC-8.

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FEATHERWEIGHT

MODEL 87

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- Completely new electronic circuit provides an incomparably strong positive location signal.
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- Guaranteed superior performance - resulting from 15 years of electronic research and construction of locating instruments.

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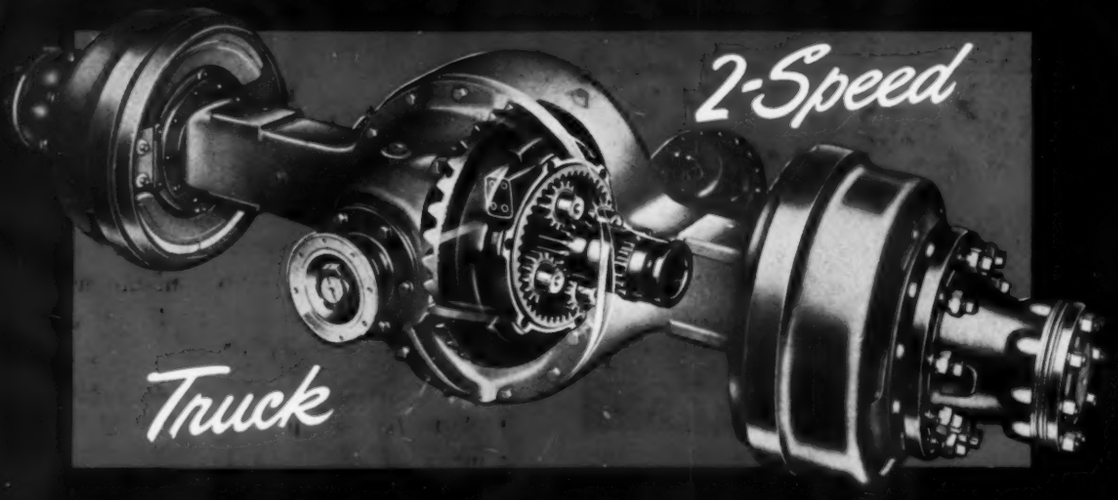

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- Extra-rugged Construction Throughout.
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THREE-WHEEL · TANDEM · PORTABLE

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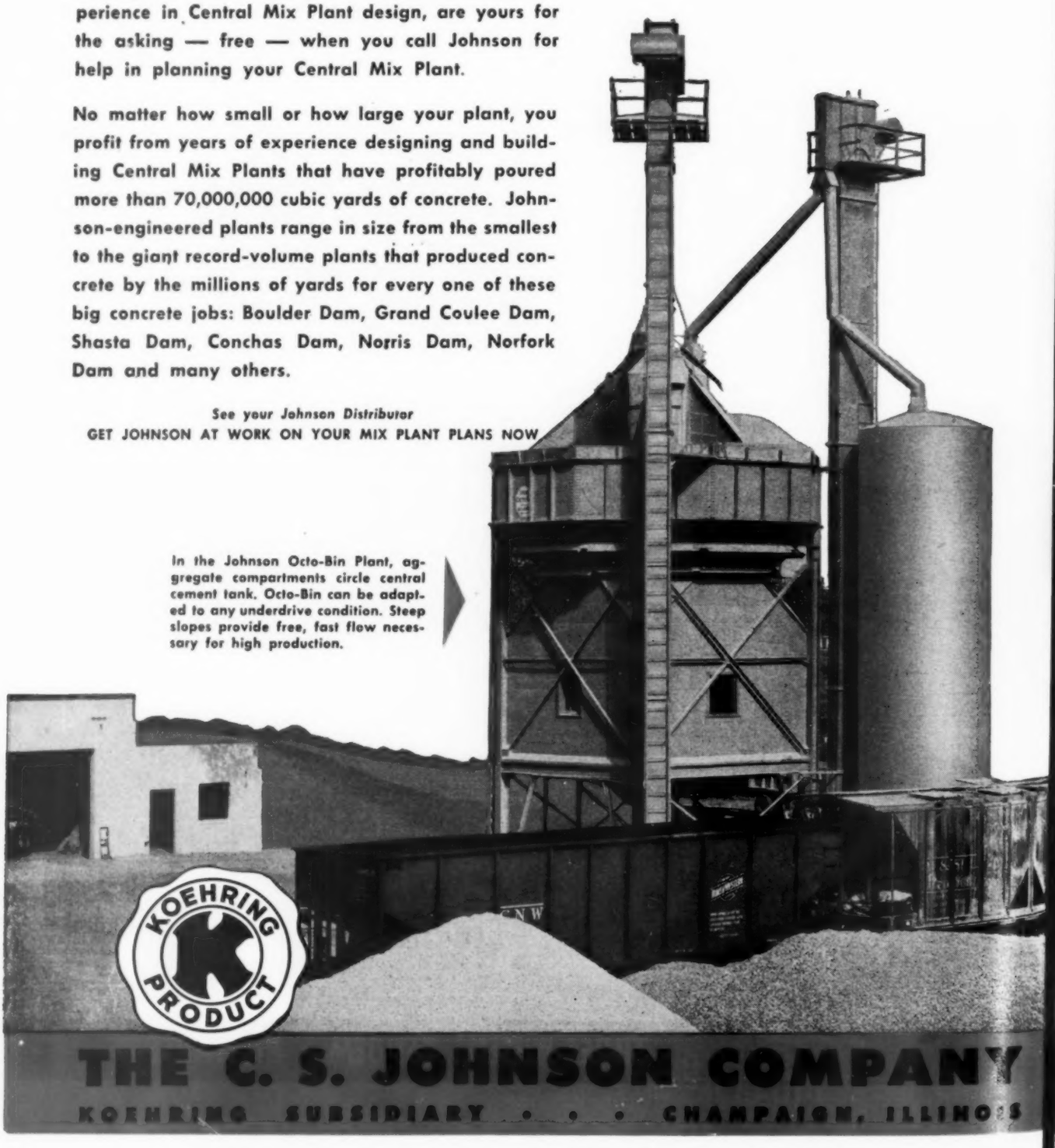
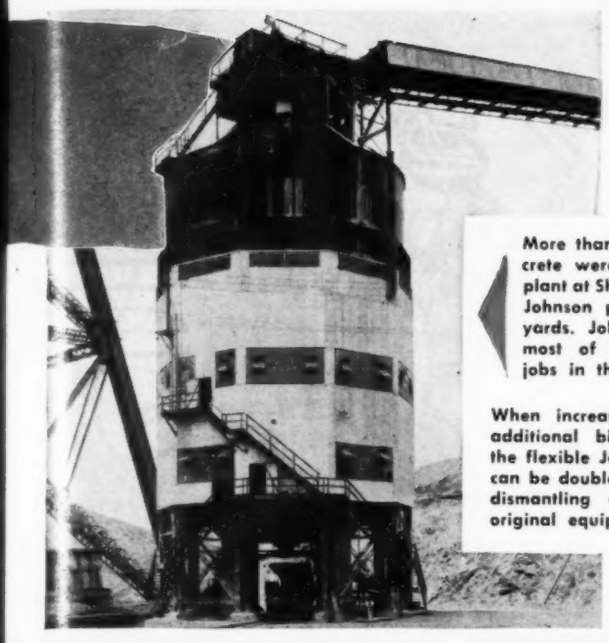
See your Johnson Distributor
GET JOHNSON AT WORK ON YOUR MIX PLANT PLANS NOW



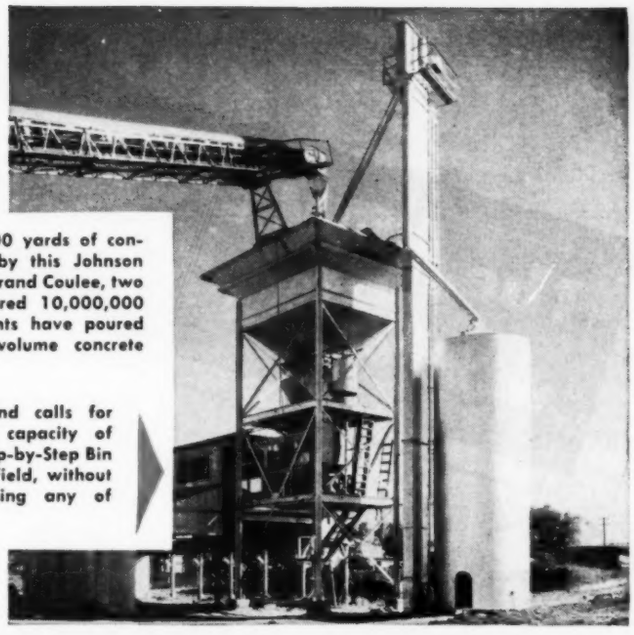
In the Johnson Octo-Bin Plant, aggregate compartments circle central cement tank. Octo-Bin can be adapted to any underdrive condition. Steep slopes provide free, fast flow necessary for high production.

THE C. S. JOHNSON COMPANY
KOEHRING SUBSIDIARY . . . CHAMPAIGN, ILLINOIS

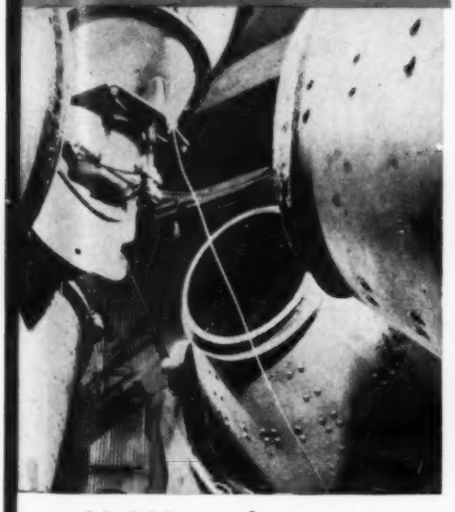


More than 5,000,000 yards of concrete were poured by this Johnson plant at Shasta. At Grand Coulee, two Johnson plants poured 10,000,000 yards. Johnson plants have poured most of the big volume concrete jobs in the U. S.

When increased demand calls for additional bin space, capacity of the flexible Johnson Step-by-Step Bin can be doubled in the field, without dismantling or sacrificing any of original equipment.



KOEHRING CONSTRUCTION MIXERS



20,000 yards in one 24-hour period

Eight 4-yard Koehring Concentric Zone mixers in the Johnson Central Mix Plant at Grand Coulee poured a record 20,000 cubic yards of concrete in one 24-hour nonstop period, after pouring 5,000,000 cubic yards prior to the record run. From midnight to midnight, these mixers never stopped once.

KOEHRING COMPANY
MILWAUKEE 10, WISCONSIN

KWIK-MIX 16-S DANDIE CONCRETE MIXER

Every batch a perfect mix

Improved mixing action of the revolving drum of the Kwik-Mix 16-S Dandie mixes every batch of concrete for perfect texture. You get better concrete because every particle of the aggregate is completely cement-coated. Same thorough mix in all Kwik-Mix Dandie mixers including 3½-S, 6-S and 11-S sizes.

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PARSONS 221 TRENCHLINER*

Sidesteps side obstructions

Boom of the Parsons 221 Trenchliner quickly and easily rides on rollers from side to side across the full width of the Trenchliner. That's why the Parsons 221 Trenchliner can cut a trench as close as 10" from side obstructions. Trenches up to 8' depth, 16" to 36" wide.

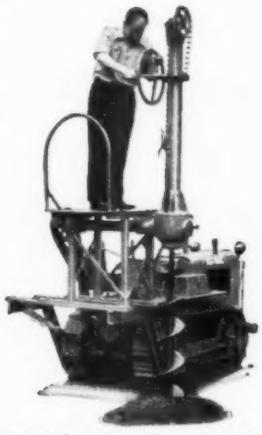
*Reg. Trade-mark

PARSONS COMPANY
NEWTON, IOWA

The NEW Crawler with Postwar Features

USTRAC AROUND THE WORLD

Shown here with 5-ft. bulldozer and double hydraulic controls that develop 800 lbs. per sq. in. working pressure. Dozer lifts 15" and lowers 6¼" below grade.



USTRAC "Speedigger" post hole digger. Easy to attach. Digs all size holes to desired depths. Thousands of "Speediggers" in use — fully proved.

Extra Power and Performance for Your Money

USTRAC is the direct descendant of the famous wartime Clark Airborne Tractor, designed and tested for heavy-duty peace-time work — small but atom-packed with power, 20 h.p. at the drawbar from the 4-cylinder Continental gas engine. Unmatched fast performance — 4 speeds forward, 4 reverse; speeds from .98 m.p.h. to 8.03, with instant reverse lever (no reverse gears to shift), a work-wonder on backfilling and dozing. Only 37" wide, 92" long, USTRAC turns on a dime, gets in and out of narrow places that block a big tractor, is moved swiftly from job to job on any truck. Besides, it cuts fuel costs as much as 50% on many jobs. You simply can't beat the USTRAC for getting a lot of work done fast, easily and at low costs. See your nearest dealer now — or write at once for full information.

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"You bet . . . and one reason is the TOP ENGINEERING SERVICE you get from Ohio Oil."*
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E. F. Craven Company
Greensboro, N. C.
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Att: Mr. F. Duval Craven

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Very truly yours,
S. C. Austin
EQUIPMENT ENGINEER.

This rock-crushing plant at Weaverville, N. C., is one of two the North Carolina State Highway Department powers with six-cylinder Series 71 General Motors Diesel engines.

Cuts Fuel Costs 75%

Sounds unbelievable, doesn't it? But that's just what happened when the North Carolina Highway Department's rock crusher at Weaverville was converted from gasoline to General Motors Diesel power.

Look at the records! To produce 300 tons per day, with the original engine, 55 to 60 gallons of gasoline were needed. Since converting to GM Diesel power in 1946, fuel consumption has dropped to 30 gallons of Diesel fuel a day. This alone amounts to a cost saving of approximately 75%. Add to economy the advantages of dependable steady operation, easy maintenance and instant response to varying power demands and you'll see why the plant foreman says, "Best power I ever saw. It's a dandy."

For economy, efficiency and versatility, the best answer to your power problem is a General Motors Series 71 Diesel engine. Write today for the complete story.

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Austin-Western Power Graders—*without* attachments—work more hours each year than ordinary graders; *with* attachments, their uses are multiplied and their value correspondingly increased.

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BUILDERS OF ROAD MACHINERY

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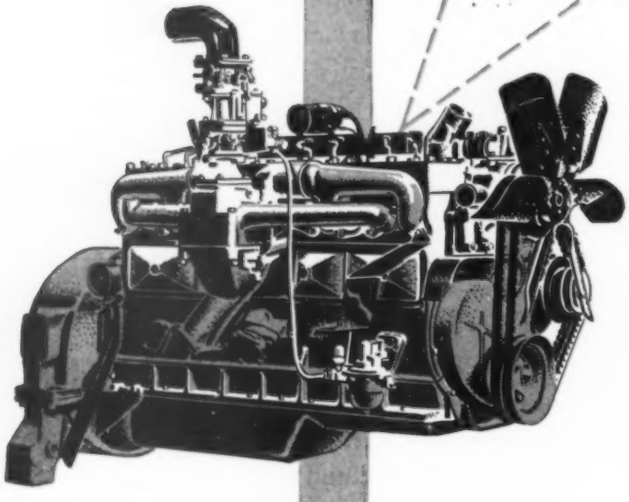
FOR A BETTER DAY'S WORK

in harvesting the world over



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THE HUBER 3-4 TON TANDEM ROLLER

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These Huber characteristics are the results of over 35 years experience in the road machinery field. During these years Huber has paid particular attention to the needs and demands of reliable road men—a practice which has enabled Huber to give you machinery more suited to all road operations.

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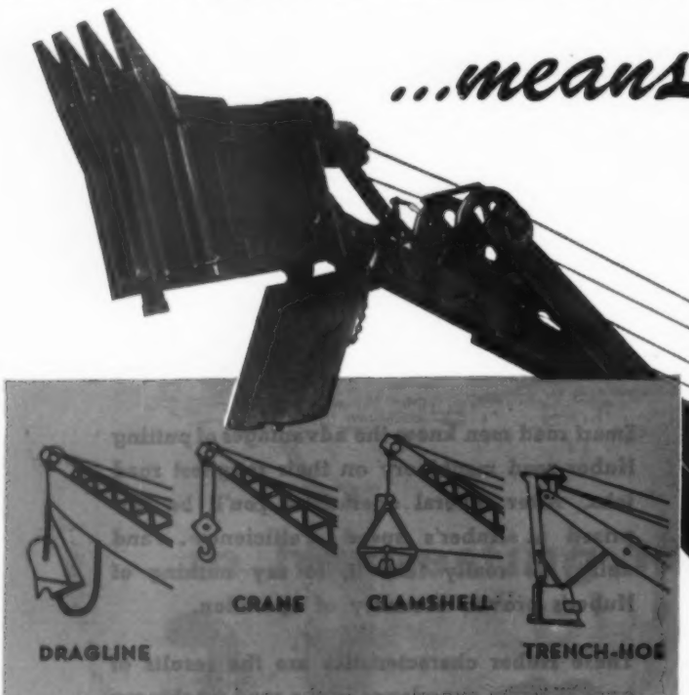
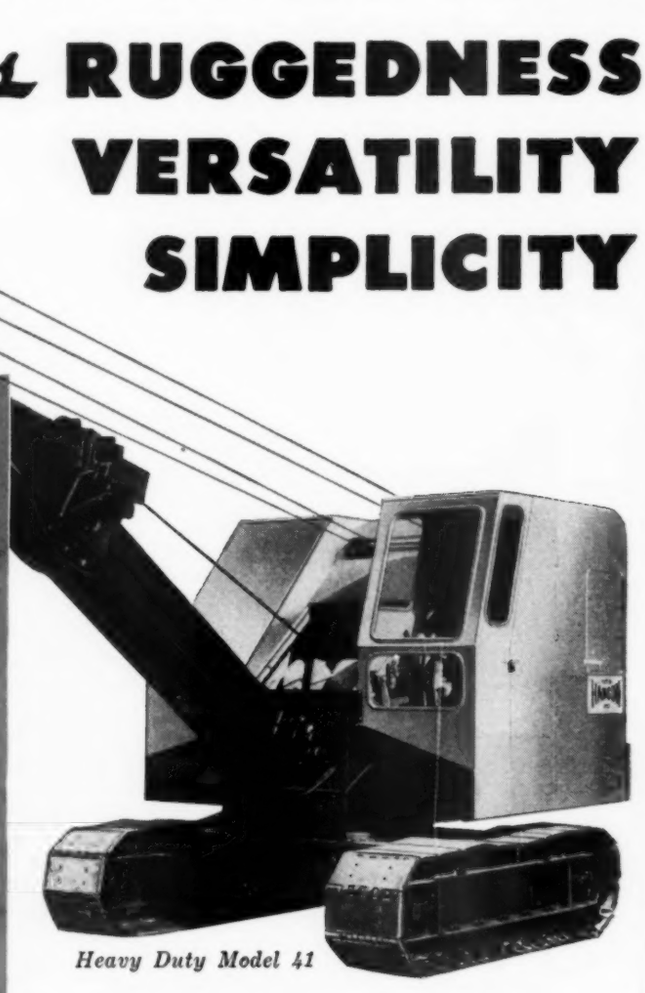
ROAD ROLLERS *and* MAINTAINERS

HANSON ENGINEERING

...means RUGGEDNESS VERSATILITY SIMPLICITY





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YARD AND DOCK CRANE

Speedy, Handy, Versatile

• 2 ton lift - 4 ton carry • Travels 2 to 40 miles per hour • Propels, raises boom, lifts and swings load simultaneously • Telescopic boom extends to 16 feet • Full revolving—270° loading arc • One man operated—hundreds of uses.

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Full Revolving • Chain Crowd • Fully enclosed steel cab • Welded steel construction • Ball or roller bearings at all vital points • Air controlled steering • Disc type clutches on swing — internal expansion, booster-type clutches on hoist and crowd • All clutches easily and quickly relined or adjusted without removing shaft assemblies • Extra long crawlers • Heavy duty industrial type motor — gasoline or diesel • All gears enclosed and running in oil bath • Two speed transmission.

Model 31 - 3/8 yd.—Model 41 - 1/2 yd.

Easily converted in the field to Trench-hoe, Crane, Dragline or Clamshell.

HANSON CLUTCH AND MACHINERY CO.
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OFF-THE-HIGHWAY TIRES

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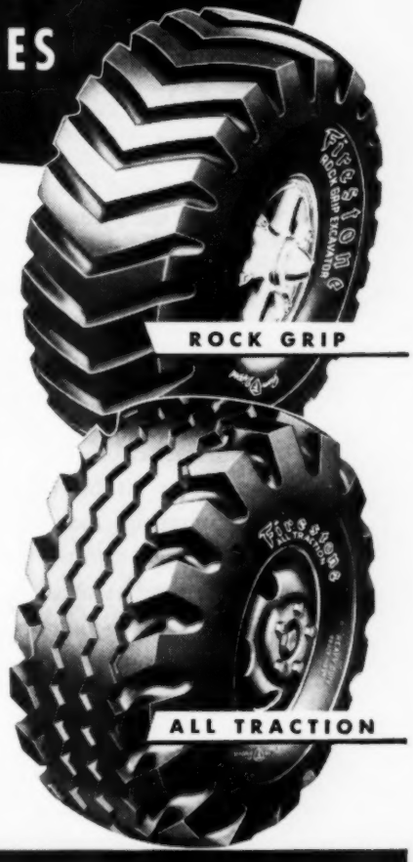

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Photo courtesy Joy Mfg. Co., Sullivan Division.

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ROADS AND STREETS

NOVEMBER, 1948 • VOL. 91 • No. 11

Dike in the Desert

Two fast scraper fleets moved 600,000 c. y. per month to complete a protective earth dike system along the Coachella Canal in Southern California

NEARLY 10 miles of earth dike, comprising over 5 million cubic yards, was placed under a single contract during the present year along the Coachella Canal in Southern California. The dike will serve as a protection against cloudbursts to a portion of the 122-mile Coachella Canal, which recently began bringing water from the Colorado River into the Coachella Valley Water District development around Indio.

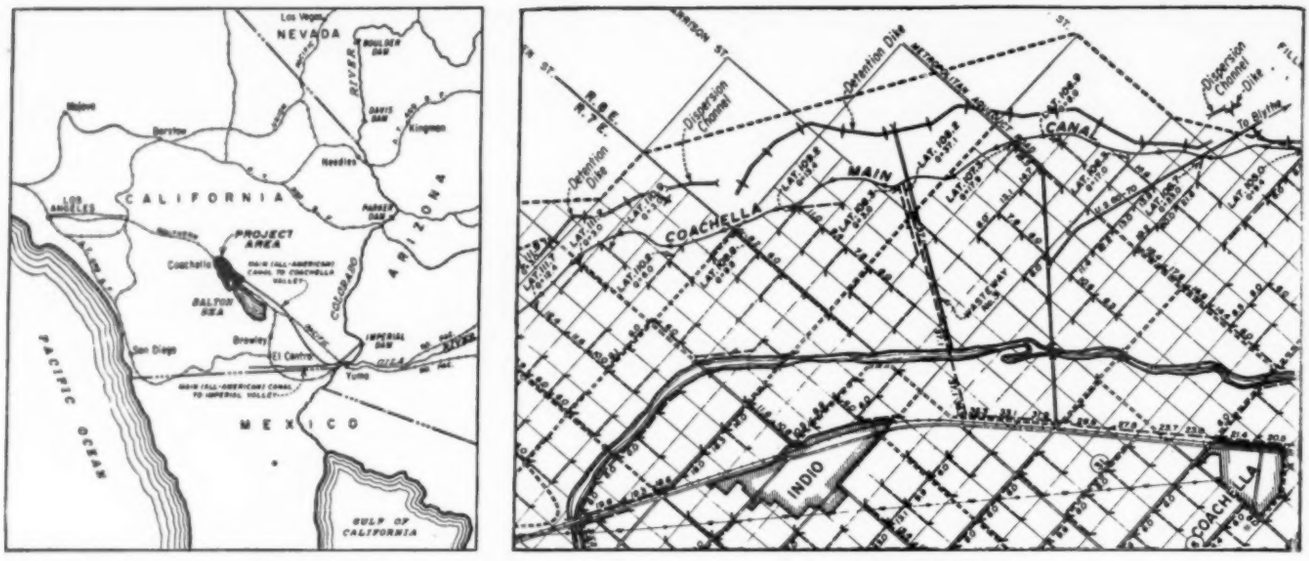
The 10-mile project under the U. S. Bureau of Reclamation was let in January, 1948, to Claude Fisher Co., Ltd., and L.A. & R.S. Crow, joint contractors. Their contract adjoins 17 miles of dike 9 miles of which was built earlier and of which 8 miles is being constructed by Marshall, Haas & Royce in a 4 million yard contract involving similar working conditions.

The Coachella Canal (see accompanying photo and maps) will supply water to over 100 square miles of rich valley land needing only water to raise citrus fruits, dates and winter vegetables. The project is made possible by the geographical fact that the valley along with the entire Salton Sea area is below sea level. Water diverted from the Colorado River at Laguna and Imperial dams near the river's mouth, flows to a level some 30 ft. above sea level near Indio, which is at minus 17 ft. elevation. The region is noted for the climatic paradox of extreme aridity punctuated by occasional flash floods from rains of 4 to 6 inches or more in a few hours, the water rushing out of the hills in torrents. Such floods, if allowed to reach the canal which skirts the first foothills, would destroy entire sections and cause expensive silting.

★A section of the 122-mile Coachella Canal, which skirts low hills famous for flash floods

Hence the dike scheme, which comprises actually a series of protective parallel embankments interconnecting natural rises of ground that could also be utilized. The system is designed as a series of retention reservoirs with dispersion channels located at strategic points. The dikes rise to about 49 or 50 ft. above canal level. The barriers are 20 ft. wide at the top and spread to a maximum width of 200 ft. at the base. The fills slope 3 to 1 on the uphill side and 2 to 1 on the canal side. A flood drainage channel which also served as a source of borrow was required to be excavated to a minimum width of 200 ft. on the uphill side of the dike.

The bid price for this big yardage was 17½ cents per cu, yd., the total bid including all items being about $916,000. The low unit bid for earth was made possible by several factors. The fine sandy material although dusty was easy to get out with scrapers, requiring little or no loosen-



★ Showing the location of the Coachella Canal (and parallel dikes) in relation to the Southern California region and the immediate area around Indio, Calif.

★ Self-propelled scrapers were confined to the longer-haul operations. This photo gives an idea of the sandy going

ing and only the usual push loading. The desert brush and sage are light here, and easily cleared; a crew of tractors with rooters performed this work speedily. No compaction was specified other than that afforded by careful routing of the equipment. No sprinkling likewise was required except where the contractor found it profitable on the haul roads, loading areas and dump areas to keep down dust and expedite operation of equipment. And although no overhaul item was included, the contractor was not required to go more than 800 ft. haul distance for his borrow material.

The contractor swung into action with a fleet which had moved nearly 2,000,000 cu. yd. by mid-April when this reporter visited the project. At that time the work was divided into two outfits, each working two shifts totaling 17 hours daily. One outfit consisted of six 18-yd. self-propelled Wooldridge scrapers (Terra Cobras) aided by two D8 Caterpillar push loaders. These high-speed units were topping out the dike, each machine making a complete hauling circle from a pit 500-700 ft. offside, up a ramp to the dumping level, and back in about 4½ minutes. A sprinkler truck and a motor grader kept the haul road smooth and compacted and an occasional pass of the sprinkler over the dumping area helped consolidate the material so that the machines could spread and get away faster.

The lower lifts of an adjacent dike section were being placed by a fleet of tractor-drawn scrapers. Units seen included 6 of the new Allis-Chalmers HD-19 tractors, 13 D8 Caterpillar tractors, 11 LeTourneau 30-yd. scrapers and 2 Wooldridge 28-yd. scrapers. A less definite haul cycle was possible for this outfit, since borrow source varied constantly in distance and elevation. Three or more tractors with dozer aprons served as push loaders. Considerable interest was shown in this fleet's operation because it represented the biggest demonstration yet of the new HD-19's with their high travel speed and horsepower.

The specifications required that the equipment be routed over the fine sandy soil to accomplish some consolidation over the entire area of the fill. Material was placed in not to exceed 12 in. layers, this depth often being reduced by the contractor for

★A separate outfit of Wooldridge Terra-Cobras with 200 h.p. Cummins engines topped out the dike—seen here loading (with pusher when available or needed); climbing ramp to top of dike; spreading; and huge borrow pit as seen from top of dike

★ (Left): Steel framed corrugated walled and roofed field shop on the Coachella job. (Right): What "make"? This very useful rig has Caterpillar tracks, an International engine, an old Pierce Arrow radiator, and a transmission that's partly Cat-60 and partly Ford

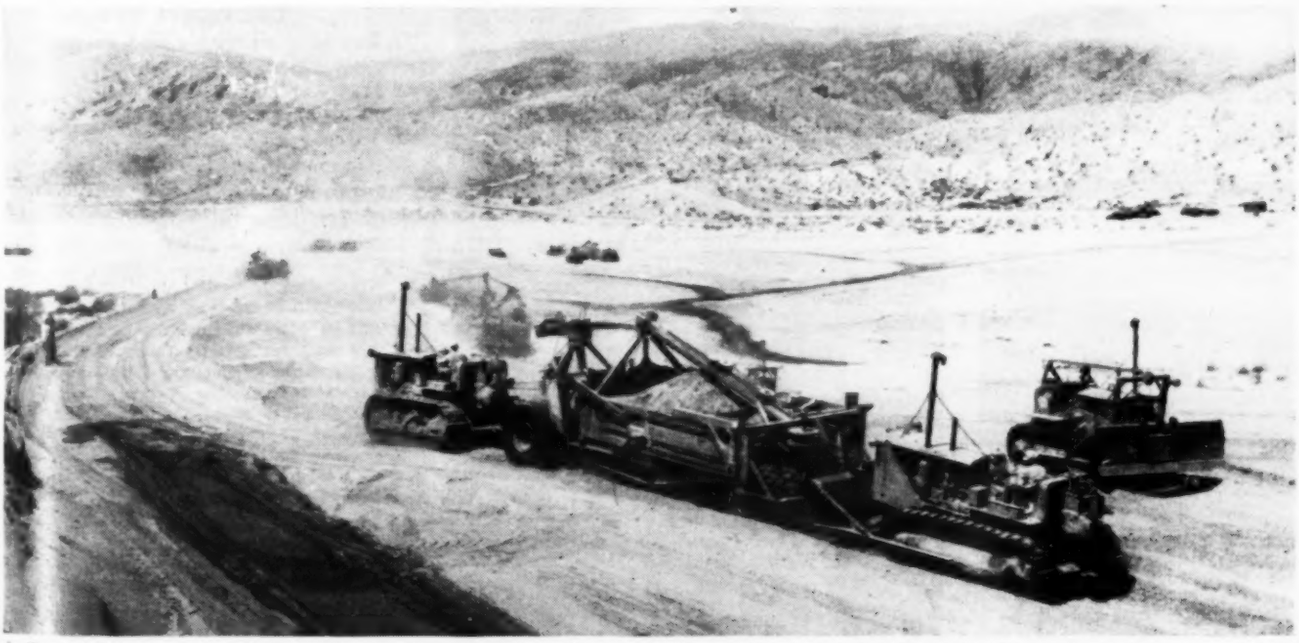
easier spreading. Payment, by the way, was for material measured in place, thus eliminating the need for measurement of borrow areas.

Night work was floodlighted by means of eight light plants mounted on towers, each having eight 1,000-watt bulbs powered by a 10 kw. gasoline-motor-driven generator. A mobile unit with two 1,000-watt bulbs aided night servicing of equipment.

Servicing was done with the help of two 6x6 type trucks, one with complete pressure lube equipment, and one with a boom and welder; and a tractor-mounted side boom for handling big tires in the field. The servicing equipment worked out from a spacious concrete-floored steel shop building, which could be unbolted in sections for transportation from job to job. The contractor also employed three mobile units which served as a tool and parts store.

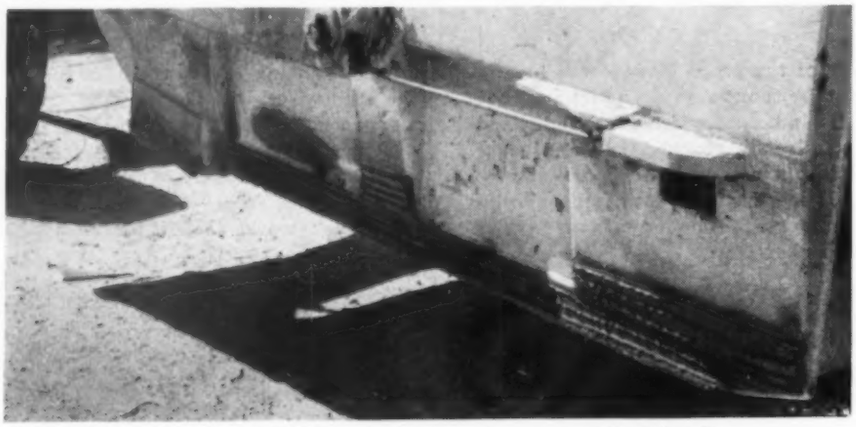
In this part of the world a description of the project would not be complete without saying something about the wind, dust and heat. Midday heat had already reached 100 degrees F. in late April, and during the summer 110 degrees plus was an everyday occurrence. Dust on windy days required shutting down about 10% of the otherwise available working time, a fact which was of concern since the contract included a $200-per-day penalty and a stiff limit of 15 months. Some storms, so severe that the men could not work, lasted for as long

★ Lugs and in fact all parts of the tractor tracks wore rapidly in the sandy going. New lugs are being welded on here, using 1 x 2 in. steel bars



★ Tractor-drawn scraper outfit, working on lower lifts of a million-yard dike section. Borrow material is being taken from high foreground and spread across distant swale. In foreground: Caterpillar D8 push tractor with LeTourneau dozer; HD-19 Allis-Chalmers tractors front and rear of a LeT 28-yd. scraper. Return haul road seen immediately behind scraper

★ Servicing trucks were all equipped with dual rear axles and dual tires in front as well as rear. Welding truck also carried acetylene equipment and small tools; grease truck included two 1,000-watt lamps, generator, compressor and dust-tight chest for tools or grease supplies



★ An example of hardfacing which was applied on all scrapers in the Fisher-Crow outfit

★ 1,000-watt light clusters. Some towers also carried searchlights

★ One of several mobile parts trucks; interiors packed with drawers, bins and racks

★ (Left): Shop interior. Bridge manufactured by Southwest Welding of L. A., utilizing a Meteor crane unit. Electric motors for bridge and crane are powered from gasoline engine driven generator setting on floor. (Right): Interior of tool and parts truck, also pictured above

as three days.

Equipment roads totaling up to 5 miles in length were constantly sprinkled, requiring three 3,000-gal. water trucks which shuttled between the job and a pumping station at the canal.

W. L. Sanders was superintendent and Avery Fisher office engineer for this project, known officially as the Coachella Valley County Water District Protective Works. C. S. Hale served as construction engineer for the U.S. Bureau of Reclamation, which designed and supervised the project for the District. The project is under the Bureau's regional office at Bounder City, Nevada; E. A. Moritz, regional director.

★ Illinois division of highway maintenance truck, along U.S. 66. Note flag and blinker lights fore and aft. Two winch lines help driver adjust angle of drag and lift drag over obstacles

★ Shoulder Ruts Continue to Cause Needless Accidents

(Editorial)

Many states are doing a fine job, as pictured here by the R and S editors' cameras. But hundreds of miles of neglected shoulders and exposed slab edges were also seen in their recent travels.

As many of ROADS AND STREETS readers know by now, one of our prime criticisms of otherwise well behaved highway departments is their easy-going attitude toward slab-edge maintenance. During May and June this editor has driven along hundreds of miles of paved arterials where anywhere from an inch to four inches of razor-sharp-edged pavement is exposed by ruts —and lurking in wait to "throw" the motorist who is luckless enough to get over the edge for an instant.

In Texas we saw a few such spots, although that state generally rates an "E." Arkansas, many miles. Missouri, intermittent. Illinois, a bad stretch. Indiana, quite a section needing shoulder attention. Ohio, ditto. To be sure, in some of these instances it had rained recently. But when you stop to think, it has always "rained recently" somewhere. Shoulders that tend to rut easily should be kept ironed out during and immediately following rains, and this work must not stop for Sunday.

Having made this monthly outburst, we present several snapshots taken recently of spring and early-summer blading and drag work, photographed in these same incessant travels. The equipment employed on earth and gravel shoulders is of great variety, and most of it is practical and economical. The men are on the job supposedly to the limit of their time and available equipment. Our editorial carping about shoulder ruts, hence, is directed to head-office policy and district-office vigilance and follow-through. The problem seems to be an administrative one.

Or are we unduly magnifying the danger of neglected shoulders?

★ Patching with cold mix helps correct the deadly "drop off" such as is seen in the foreground here

★ U.S. 40 near Junction City, Kansas—another effective shoulder outfit, consisting of tow-type maintainer and Fordson tractor

★ Another Illinois shoulder-drag outfit that does the job economically and well. Warning sign, plenty big and conspicuous!

★ U.S. 66 here is graded for future double tracking. The wide grade is a maintenance problem, and continuous ironing out is necessary to insure drainage

Sheep's Foot Rollers

—COMPACTION CONTROVERSY

How one manufacturer has approached the problem of roller standardization

By D. K. Heiple
Chief Field Engineer, R. G. LeTourneau, Inc., Peoria, Ill.

TWICE in the two years past, our company has made a survey to determine the needs of the Corps of Engineers, Bureau of Reclamation, State Highway Departments, and Contractors throughout the country with regard to the common compacting tool, the sheep's foot roller. The results have shown a desire for almost as many variations in types and design as there are jobs on which to place them. Consequently, manufacturers, including ourselves, have built numerous models, each to meet a widely varying set of recommendations, and each possessing a corresponding variety of capabilities.

The editors of ROADS AND STREETS have twice, in the year 1948, called attention to this lack of standardization and its effect on the industry. The problem, then, has certainly been recognized. The point now is what is to be done about it.

Aims Summarized

Following our most recent survey and an unsuccessful attempt to combine in one roller the requirements of tamping foot area, spacing, length and ground pressure, we decided to stop asking the user and ask ourselves what he really wanted.

In our opinion, State and Federal Agencies want:

1. Road subgrades that are thoroughly compacted, reducing to a minimum the rocking of slabs under heavy wheel loads, and elimination of buckling due to heaving action of frost and heat.

2. Solid, impervious dams and levees with no stratification or cleavage planes — a homogeneous mass compacted to a point of continuous strength, allowing no weak point for impounded water to work upon.

3. Extremely high density subgrades for airports capable of supporting the daily increasing wheel loads without increasing the already almost prohibitive amounts of concrete and reinforcing steel.

Contractors want:

1. A roller to fit Engineers' requirements on *all* jobs, roads—dams —airports.

2. Design to efficiently utilize power of towing equipment, and ground pressure that reduces the number of passes required.

3. Self-cleaning, long-wearing feet and rugged construction for trouble-free maintenance.

With only these specifications to adhere to, our company then produced a new roller*. A big roller for earth-fill dams and super airports, but not so big that the road contractor could not use it. A wide range of ground pressures was incorporated through use of external ballast boxes as well as the more common drum loading, giving 218 to 670 psi. The basic principle of this design was the desire to achieve compaction rather than to satisfy any particular group of soils engineers.

The remarkable fact that then became apparent was that such an approach had resulted in meeting more individual requirements than before, including some 29 of the state highway departments.

*The Model 144 Tournapacker.

★ **WHO'S ROLLER IS WHICH**—and what is the difference, if any, between specification details? What part should who play in standardization?

An indicated conclusion, which we would like to jump to, is that the construction group is actually not so far apart in its thinking in spite of any contrary opinion. Naturally, some differences will always exist because soil classifications, moisture, and temperatures vary and in many locations require special design and execution to obtain the desired result.

Who's at Fault?

Perhaps the fault for the existing situation lies in the lap of the manufacturer and contractor, who, because they are not sufficiently interested in the problem have left the entire solution to the engineer. It is not hard to believe that the engineer would prefer simply to specify a certain degree of compaction and leave the contractor to his own devices as how this is to be accomplished.

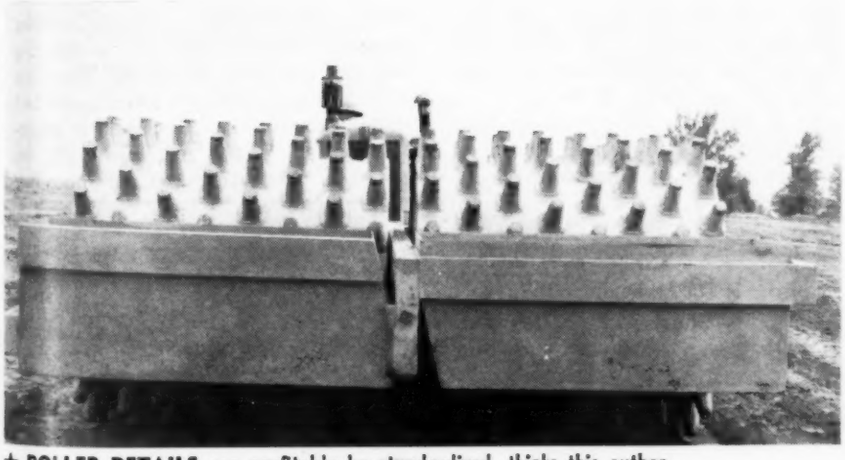
In defense of ourselves and the contractors, however, it must be said that under such conditions the problem of acquiring the know-how for an almost infinite number of local conditions would be all but impossible. The contractor, then, can only turn again to the compaction expert to tell him what to do. Then, the soils man, who no more wants to set up procedures for the whole range of rollers than we wish to learn about all the soils, sets up one procedure for a roller whose specifications he names, and we've completed the circle.

The problem is where to break the chain. We think our new roller is a start. Confronted with only one roller design, or possibly two, that lands squarely astraddle the majority of existing specifications, the engineers will have a common basing point from which to start a compaction procedure. At present, the manufacturer is at one end, the engineer at the other and the contractor is in the bind.

"Do the Job"

Each of us can do much in making the job simpler for the other until all specifications can be stated as simply as one construction engineer who answered our inquiry put it, "Our present practice is very much in line with the statement made in your letter that the equipment is expected to do the job rather than meet any very exacting dimension, weight, and pressure requirements.

"We check our embankment compaction by regular tests in the field, and as long as good results obtain we do not fuss too much about the kind of roller used. With this in view, should one of our Contractors acquire your new tournapacker, it will be used in our work on the basis of results rather than equipment specifications. We would prefer continuing on this basis until our new issue of specifications is completed. Further Special Provisions to cover each roller would, we feel, only cause confusion."



★ **ROLLER DETAILS** can profitably be standardized, thinks this author, whose company makes the Tournapacker, shown in lower view

E. R. Needles Slated for ARBA Presidency

E. R. Needles, of the consulting engineering firm of Howard-Needles-Tammen & Bergendoff, New York, N.Y., has been nominated president of the American Road Builder's Association for 1949. His name and others, as follows, are subject to confirmation by ballot to the membership. Other nominees:

Vice-presidents: Paul B. Reinhold, pres., Atlas Equipment Co., Pittsburgh, Pa.; Charles W. Smith, pres., Smith Engineering & Construction Co., Pensacola, Fla.; W. A. Roberts, exec. v.p., Allis-Chalmers Mfg. Co., Milwaukee, Wis.; T. E. Stanton, materials and research engineer, California Division of Highway, Sacramento.

Treasurer: Jennings Randolph, assist. to the president, Capitol Airlines, Washington, D. C.

Directors (term ending 1952): Paul R. Andrews, exec. secy., Georgia Highway Contractors Association, Atlanta, Ga.; Robert B. Brooks, consulting engineer, St. Louis Mo.; Bernard Gray, general manager, Asphalt Institute, New York, N.Y.; Robert M. Reindollar, chairman, Maryland State Roads Commission, Baltimore; Paul B. Rynning, county highway engineer, Medford, Oregon; Charles H. Sells, consulting engineer, Albany, N.Y.; A. R. Taylor, consulting engineer, Koppers Company, Pittsburgh, Pa.

New Diversion Attempt Fails in N. Jersey

A renewed attempt to finance a $100 million veterans' bonus in New Jersey from an increase in the state's gasoline tax died in the legislative session which has just ended. At no time was there even close to a majority for the plan to pay for the bonus with this special taxation of a special group of taxpayers. Highway users, opposing the one-cent gas tax increase, made it clear that they were not opposing the bonus as such.

●

Tax Diversion Increases—According to the 1947 report of the Public Roads Administration, tax diversion in 1947 was 80% higher than in 1946. Diversion in 1946 was $94,578,000 and in 1947, $170,518,000.

"New Criteria" Bomber Base

- **Lane Construction Corp. and T. W. Cunningham, Inc., pushing $13,000,000 joint venture project with 700 pieces of equipment**
- **Runway for very heavy planes includes massive multi-layered, super-compacted gravel and stone base**
- **Operations reached peak this summer, with 30-35,000 cu. yd. earth moved and 12-15,000 cu. yd. gravel spread daily along with many other items**

Harold J. McKeever
Editor, ROADS AND STREETS

UP in Northern Maine, in the heart of the famous Aroostook potato country, is a piece of timber and swamp and rock outcropping fifteen square miles in area. Here, in what is undoubtedly the largest airfield construction job going on today in the U. S., Army engineers and contractors are carving a home for heavy bombers of the B-36 class.

The Limestone Air Force Base, named for a nearby community on the New Brunswick border, will represent the latest in functional design thinking for very heavy planes. Its site, only 700 feet above sea level and said to be exceptionally free of fog, is strategically located for world air traffic. Although the Air Force has a large field at Presque Isle, some 30 miles away, this field is to represent entirely new design criteria developed since World War II.

Very little blueprinting had been done when the Army decided to get going early in 1947. A joint-venture, cost-plus-fixed-fee contract was signed with Lane Construction Corp. of Meriden, Conn., and Brunswick, Me., and T. W. Cunningham, Inc., of Bangor, Me. The contractors hastily rounded up over a million dollars' worth of equipment, moved in and began clearing and cutting access roads in May, 1947. Design details have been developed as the work progressed.

Many Project Features

The present contract at this field includes the following items, to mention merely the principal ones:

(1) A 2-mile-long runway, which can be described as "very long, wide and heavily built," together with a 100-ft. wide taxiway, a 400 x 2000 ft. long parking apron, and another taxi system leading to hangers. Pavement layout provides for future expansions.

(2) A modern operations building and control tower.

(3) A concrete arch-roofed hangar of near-record dimensions. This unusual structure, designed to the so-called Z-D principal by Roberts & Schaefer of Chicago, will be described in a later issue of ROADS & STREETS.

(4) Permanent barracks for 250 field and flight personnel, designed by Alonzo J. Harriman, of Auburn, Me.

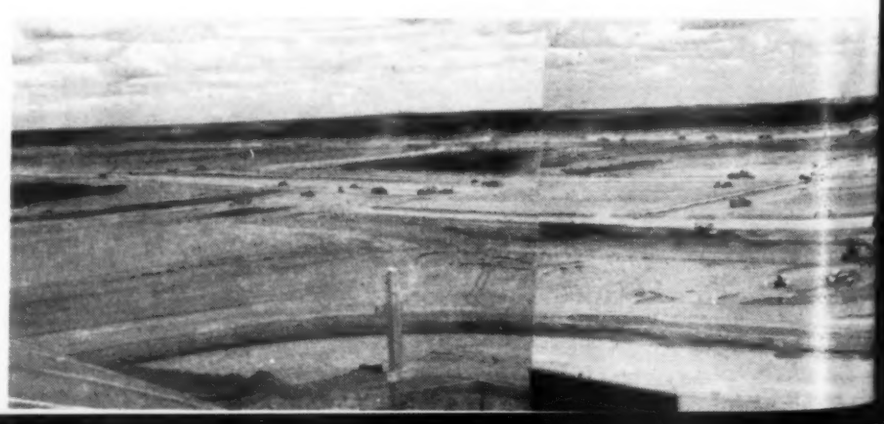
(5) A modern water system, including deep wells, a 2-mile 16-in. cast iron water line, trenched through rock and clay, an underground storage reservoir, booster pumps and an elevated reservoir for fire protection. Seven deep wells, involving 10-in. diameter shielded bore above rock and 8-in. holes into rock, were drilled under a separate contract by Trask Artesian Well Co., of Dover, N. H. Water and also sewerage facilities were designed by Metcalf and Eddy of Boston.

(6) A 5½-mile railroad spur into the field from the Bangor & Aroostock RR. terminating at Limestone.

Ending 2nd Year

While attacking the general clearing, the Lane-Cunningham outfit also began the 1947 summer by building the rail spur and erecting a score of barracks for housing some 600 initial workers. Worker attractions include a fire station, mess hall, theater, infirmary and PX store. The site also was cleared for a repair yard some 300 by 2000 ft. in area, and a large sectional timber shop building was moved in from the de-activated Houlton air base to the south. And some earthmoving was started, along with excavation of drainage ditches through the flat, boggy site.

Then came the Maine winter, with temperatures as low as 45 below zero and a whole month of zero or colder around the clock. Tractors had to be hooded, and every two hours all night motors were started and warmed up for awhile, in order to be able to start them mornings. In spite of such rigors, a crew of 900 men accomplished most of the work of clearing 930 acres and grubbing 390 acres required for paved areas. Two big 50-ton earth moving buggies aided the tractors in moving big stumps from the area. Building foundations and floors were concreted under tarpaulins with portable gasoline units. But a real onslaught on material production and earthmoving



★ Looking along the two miles (plus or minus) length of main runway strip, during the height of the grading and base construction operations

for the B-36's

had to await the late spring thawing and drying out. Volume production began early in June.

★ Huge gravel stockpile as it looked June 2 when work was getting under way in earnest

Storm and Under Drains

Storm drainage installed at Limestone consists of 15 to 60 in. concrete pipe, with no unusual design features. A thorough system of subdrains, parallel to pavement edges, was also installed consisting of spiral corrugated metal pipe, perforated and asphalt coated, principal size being 6 in. The taxiways and the 400-ft. wide apron slope in one direction, and the paved runway is roofed at the center-line, drainage slope being 1.5%.

Earth and rock removal for leveling has been comparatively a small operation, considering the large area involved, due to the fact that the field occupies a fairly level plateau requiring only shallow cuts and fills. Cuts for runway grading reach a maximum depth of 25 ft. at one end, where 750,000 cu. ft. of material had to be excavated in 2,000 ft. of runway length and moved toward the middle part of the strip. Quantities include 650,000 cu. yd. of loam stripping, 150,000 cu. yd. of muck excavation, 1,250,000 cu. yd. of earth excavation, and 100,000 cu. yd. of borrow excavation. Only minor rock outcroppings slowed the work, and all borrow excavation was taken from low knolls in the 1350-ft. distance between the runway and the parallel taxiway, thus minimizing haul.

The site also includes many swampy or peaty spots, and surface drainage was early seen to be a critical need. Foresight in getting a system of drainage ditches completed late in 1947 early in the present year paid off by eliminating pockets of standing water in the impervious glacial till and thus permitting volume production from early June onward.

High Densities Sought

Runway and other pavement area were first stripped of unsatisfactory soil and the top 6 in. compacted to 100% modified AASHO density, using sheepsfoot rollers with 550 psi. on foot areas. In cut sections the subgrade was first roughed with rooters and scarifiers. The subsoil is glacial till except for pockets of swamp material which were removed.

Earth layers were compacted with 550 psi. sheepsfoot rollers, in drums from 42 to 60 in. diameter. The contractor standardized on three drum units on a single axle, for flexibility. Densities of 100% modified AASHO under pavement areas and 95% under adjacent areas were specified. A minimum of six passes was required, and the spirit of the entire organization was not to merely meet a specification but to build a real runway for the big ships.

Earthmoving was scheduled to average 22,000 cu. yd. per 10-hour day, but reached a peak of 35,000 during July and August. Fleets of Euclid bottom-dump wagons loaded with two Euclid loaders were scheduled to move about 550,000 cu. yd. this year. They were averaging about 16,000 cu. yd. daily during the writer's August visit, taking out material with the aid of 3-toothed rippers. Elsewhere along the big runway tractor-drawn scraper outfits were working adjacent to self-powered scraper teams, the usual push-loading and push-and-snatch loading methods being worked. Truck-shovel work was in progress simultaneously in pockets or in tight material in and around outcroppings.

In one August week, production included 160,000 cu. yd. of common, 90,000 cu. yd. of gravel placement and stockpiling or placing of nearly 10,000 cu. yd. of crushed stone.

Thick Layered Base

Layered base construction for the runway and other pavement is composed of washed gravel layers followed by two layers of dry-choked crushed rock, each 4½ in. compacted thickness. Gravel at least 35% passing ¼ in. and not over 6% passing 200-mesh was specified and the engineers sought to limit fines to 4%, to insure a non-frost-heaving base. Gravel size up to ⅔ layer thickness was permitted.

The bottom layers of gravel were specified to be compacted to 95% and

Some of the Quantities

960	acres clearing
390	acres grubbing
125,000	c.y. muck excavation
650,000	c.y. top-soil stripping
1,250,000	c.y. earth excavation (incl. 100,000 c.y. borrow)
1,250,000	c.y. fill compaction
310,000	c.y. stripping for gravel pit and quarry
900,000	c.y. pit-run gravel (sluiced)
105,000	c.y. trenching and ditching
200,000	c.y. materials for roads
320,000	lin. ft. quarry drilling
160,000	c.y. rock excavation at quarry

★ Euclid Wagons from the loader, dumping in foreground for grading apron area. Two Adams graders and two or three sheepsfoot units kept up with this operation, which was carried on simultaneously with main-runway grading

Grading at 180,000-yd. Weekly Clip

★ The larger rollers are the new Gebharts, put on the job in August. Smaller rollers, make not identified. See text for rolling specifications

★ Several makes and drum sizes of sheepsfoot rollers were used, but all were in single-axle units for flexibility. (International tractor)

★ One of two Euclid loaders on the big borrow job. Heavy soil necessitated a rooter and two tractors to pull the loader

★ Both push and snatch tractors (Caterpillar D8's) assisted the Super C Tournapulls

the top layers to 100% standard density as determined by the so-called Providence method (devised by the old Providence district of USED). This test, applicable to granular material, is a severe one, resulting in typical densities of 148 lb. per cu. ft.

Pneumatic-tired rollers are employed for gravel densification, gravel being placed in 9 to 12-in. layers and rolled with a Porter 200-ton four-pneumatic-tired roller followed by a 123-ton 6-tired roller, with four roller passes specified as a minimum. The Porter unit, the same type unit that was employed on the Baltimore airport [Dec. '47 R&S], was drawn by two heavy tractors in tandem. The other unit required a single heavy tractor. Some preliminary rolling with lighter rubber-tired equipment sometimes preceded these jumbos, which did valiant service according to the engineers, who pointed out that the extreme densities considered necessary for very heavy planes such as the B-36 (with 150 tons maximum on a single tire) cannot be achieved in gravel without such heavy equipment. While costly, these big machines permit thicker layers and fewer passes, and thus are actually an economy.

Gravel base placement, as seen by this writer, was indeed a show—a demonstration of the efficiency that can be achieved only when a crew of dozer operators and truck drivers learn to "fly in formation." Spreading advanced along a 100-ft.-wide front. Two bulldozers worked in a pair spread immediately behind the dump trucks, aided by a third dozer. Trucks with 5 to 8 tons of gravel arrived so fast that from two to five were dumping at any given moment, in spite of the fact that the drivers took only an instant to hoist, drop the load, and get away while lowering the beds. Trucks pulled in over the fresh carpet, dumped, turned empty, and skedaddled back

along the 50-ft. wide haul road to the pit some two miles distant. No backing or Y-ing, but a smooth synchronized operation that brought better than a thousand yards an hour from three pit shovels. Under-loading of trucks was the policy in the interest of efficiency and economy.

Stone Also Super Compacted

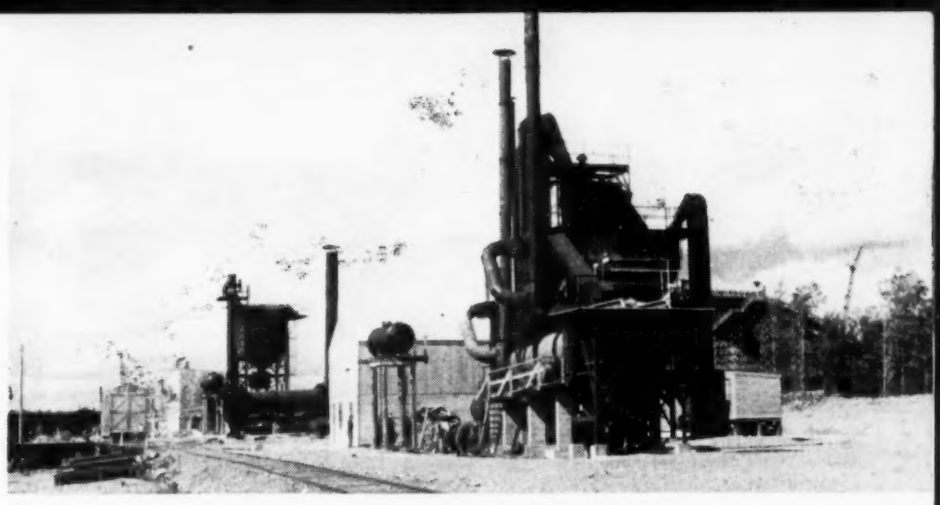
Material for the stone layers was spread by trucks feeding into two veteran Adnum black-top pavers, aided by a motor grader for skimming and clean-up. Three 10-ton and more recently three new Buffalo-Springfield 21-ton steel rollers, one a 3-wheel tandem, were included in the stone-base outfit. Some rollers towed brooms to supplement power broom units. Screenings for dry choke for each of the two layers were spread with Good Roads chip spreaders, the surface skimmed, dry-rolled, sprinkled rolled again, then prime coated to await the hot-mix.

What density or stability of stone layers? We asked that question which is answered informally by reporting that these layers, too, were given a couple of passes of the 200-ton roller.

All this time we've been talking gravel and stone, so let's have a look at the production end. A 9-million-yard gravel deposit called Chapman pit was uncovered about a mile off-side from the runway. Analysis showed the material to be excellent except for excess silt and clay fines. For the runway base, after some consideration, the engineers and contractors agreed on the idea of sluicing the material down from a working face of some 25 to 30 ft., thus mixing it partially, and further sluicing to wash out sufficient fines to make it pass the under-6% specification. Two sluicing outfits were set up, drawing water from a large pond that had once been home to a family of beavers. Via 8-in. pipe, 8 Chrysler-engine-powered Army-surplus pumps fed the two fire hose outfits, each of which tapped the pipe line with three 2-in. hose lines with fire nozzles working at about 100 lb. pressure.

Two or three 1½ and 2-yd. shovels worked the sluiced material, loading trucks which (at least during our visit) were always lined up so that the shovels never had to wait. An inspector at each shovel and one on the grade watched closely over the uniformity, and shovel operators were trained to make load passes carefully to select well washed material and help complete the mixing.

★ Brrr! Starting stripping operations January 15, at —15 degrees. (Note ground vapor)



★ Along a rail spur, are located two complete hot-mix plants. New Hetherington & Berner plant with two dryers in foreground

Two Gravel Plants

Sluice water, being limited in supply, was reclaimed for the second hose truck, located several thousand feet down the face, by means of dozer-built settling basins.

Gravel for concrete and hot-mix use was also loaded without sluicing for delivery to two gravel crushing and washing plants located en route to the runway. Crushing, screening and copious washing characterizes the two plants erected for gravel processing. One is an "assembled" plant, consisting of a reciprocating feeder, rotary scalping screen, gyratory crusher (Allis-Chalmers), 50-ft. bucket elevator, vibratory screen (Seco), paddle washer (vintage Good Roads), 100-ton bin, and D13000 Caterpillar diesel generator, the latter furnishing belt power to the crusher and 220 volts to individual motors on other units.

The other outfit, located adjacent, is mainly of Holland manufacture. It comprises two portable assemblies which include a 3030 double breaker, 4′ x 12′ vibrating screen, 30″ x 100′ electrically powered belt, another 4′ x 12′ vibrating screen with battery of water nozzles, all by Holland; an Eagle screw washer, two 25-yd. Cemco bins, and a Murphy diesel power plant which likewise supplied both belt power for the breaker and current for other units.

Each of the afore-described plants is supplied with water from a 250-gpm. Chrysler engined pump, via 6-in. steel pipe, water being wasted through corrugated pipes.

★ Robert E. Lee, resident engineer for Corps of Engineers; D. M. Mills, asst. resident engineer; Lt. Col. Phillip Haas, liaison officer, army air forces; F. A. Davis, Cunningham's gen. supt.

★ Three dozers spread on a 100-ft. front in placing gravel for base, keeping up with trucks which dumped 200 or more loads per hour

On these Pages are Scenes Showing Gravel for the Heavy

These two plants succeeded in producing 40 and 80-100 tons per hour, respectively, in spite of slowing down due to the heavy washing process, and have worked two 10-hour shifts much of the time. A huge stockpile built up early in the summer gradually melted as base construction progressed. Approximately 21,000 cu. yd. of washed gravel was placed as ballast for the rail spur.

Large Quarry Required

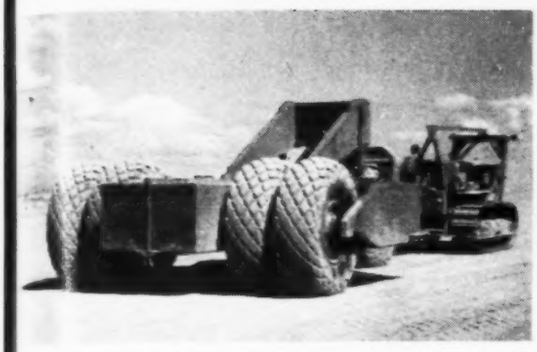
Stone production which will total some 160,000 cu. yd. also has been paced to a speed commensurate with the big job. A 2½-yd. Northwest shovel, working in a large quarry also located about a mile off-side, supplied a near-by crushing plant via 8 to 10 Euclid rock trucks. Six wagon drills of assorted makes put down the blast holes, powered by a phalanx of five new Sullivan 315 compressors and one Gardner-Denver 500. The air lines made quite an installation, beginning with a 6-in. trunk along the back of the ledge, and working down via 4-in. connections to a system of parallel 3-in. pipe leads to wagon drill stations across the working floor.

The stone at Limestone, which is really not limestone but a calcareous shale, proved difficult to blast without some experimentation, due to vertical lamination and to non-uniformity. A typical blast set off during the writer's visit consisted of an 1850-lb. charge of 40% gelatine dynamite placed in 1½ x 8 in. sticks in 79 holes averaging 26 ft. in depth. Holes for each blast were drilled in two rows, located respectively about 18 and 23 ft. back of the face and designed to throw the material toward the pit. Boulders from the previous blast requiring secondary shooting were drilled and shot in the same blast, which yielded 2700 cu. yd. solid rock or some 4000 loose yards. As many as three double lines of holes were usually in process of being drilled.

200-ton Stone Plant

The stone plant, housed for winter protection, is designed to produce several classes of aggregates, including ¾ to 3 in. for base, ¼ to ¾ for bituminous concrete surfacing, and ¼ in. minus for runway base filler. Over

★ Sluicing gravel, to bring down and mix material from the face and wash out silt. Army-surplus pumps fed the hose. Note standby emergency unit. A 2-yd. Northwest seen loading to Ward LaFrance trucks



★ A 123-ton compactor (left) and the Porter 200-ton roller (right) at work on base compaction. The same machines are also taken over the stone base layers, over which a seal and two courses of hot-mixed asphaltic concrete are then placed

Runways Base Being Sluiced, Loaded, Processed, Spread and Rolled

a hundred thousand tons of these materials were stockpiled during the summer, by a small fleet of dump trucks which used shelf ramps to get up on the larger piles. A 2-yd. Lima and a ¾-yd. Bucyrus-Erie shovel loaded out stone, these shovels sending a tonnage over the haul road far in excess of the crusher capacity, once base construction really got going.

The rock plant is a Diamond outfit, mainly, consisting of a Model 3030 x 42 primary breaker, a Model 95 unit with 10 x 36 secondary and 22 x 40 roll crusher, and 24" or 30" belts, leading to three 40-ton bins.

Bituminous Paving Planned

During our August visit, in addition to stockpiling both gravel and stone for surfacing, two hot-mix plants each of 70 tons per hour capacity, and including 4000-lb. pugs, were being set up in hopes of making a start on hot-mix paving this year. One plant is a modern Hetherington & Berner, with two dryers. The other is an assembled plant. The two plants are located along a rail spur, in line with two bulk cement silos with underground car unloading equipment, the cement bins being adjacent to a large concrete batch plant for transit mix delivery of concrete for the big arched hangar and other building work.

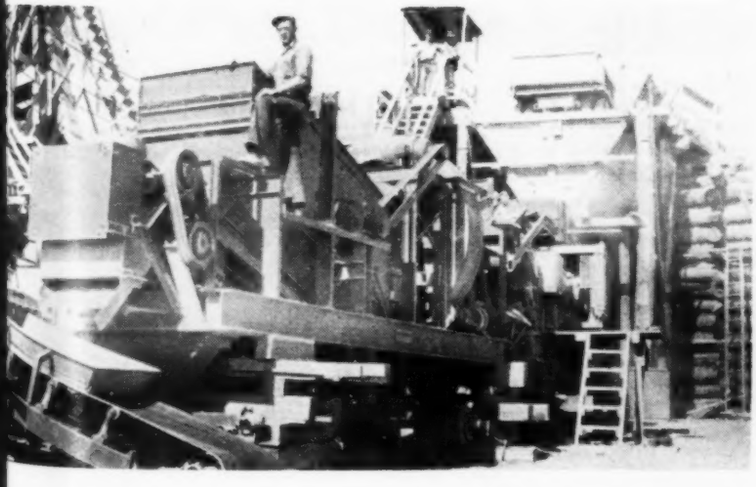
Latest modern equipment was scheduled to be used throughout on hot-mix placement. Two new Barber-Greene pavers were due in, and the three afore-mentioned 21-ton steel rollers were to be employed to insure utmost density and stability in the heavy two-layer paving.

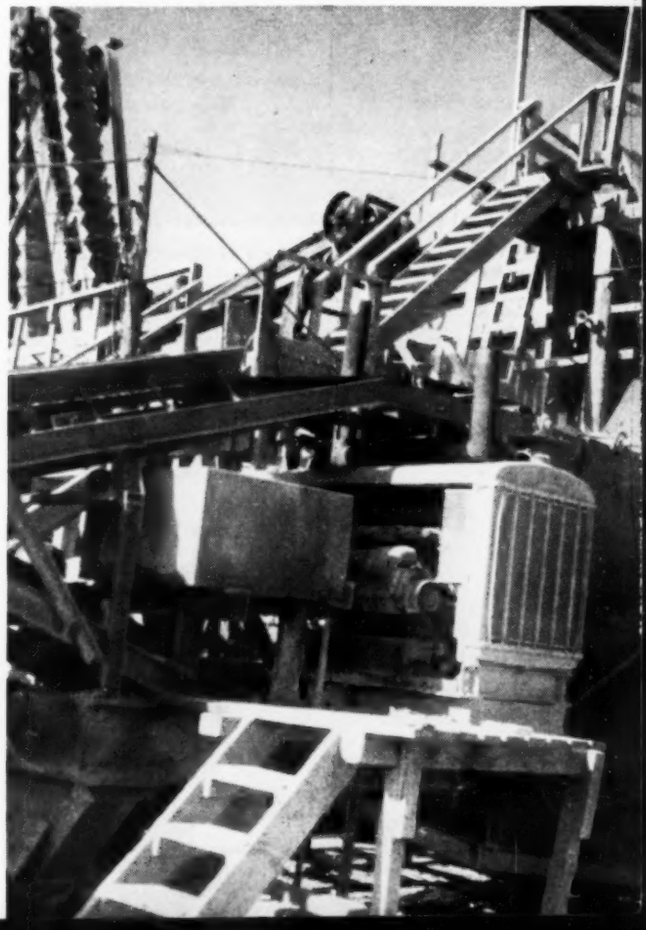
How Job Is Run

This big project is well on schedule, and in some phases ahead, thanks to top-flight management seemingly all along the line. Equipment problems were solved by pooling units from both contractors with numerous Army-owned machines, along with other equipment obtained from "all over New England." Machinery is constantly coming in or going out on flat cars.

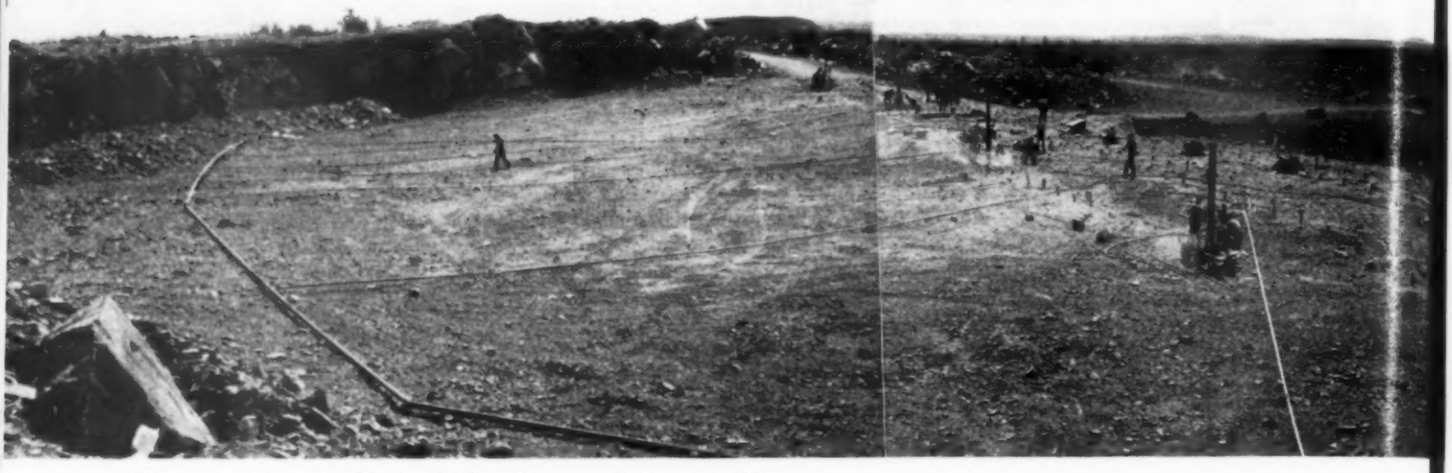
Good skilled men, particularly mechanics, have been a problem; the men get restless and pine for Boston or other centers nearer home. The men

★ Two complete crushing, screening and washing plants were assembled, 120-140 tons per hour combined capacity. See article for details. Included two Holland mobile units, Murphy diesel engine powered





★ Five new Sullivan 315's and a Gardner-Denver 500 (latter hidden behind other machines) were used to supply quarry needs. Note twin surge tanks at right



★ View across quarry, showing pipe hook-up for air supply to wagon drills

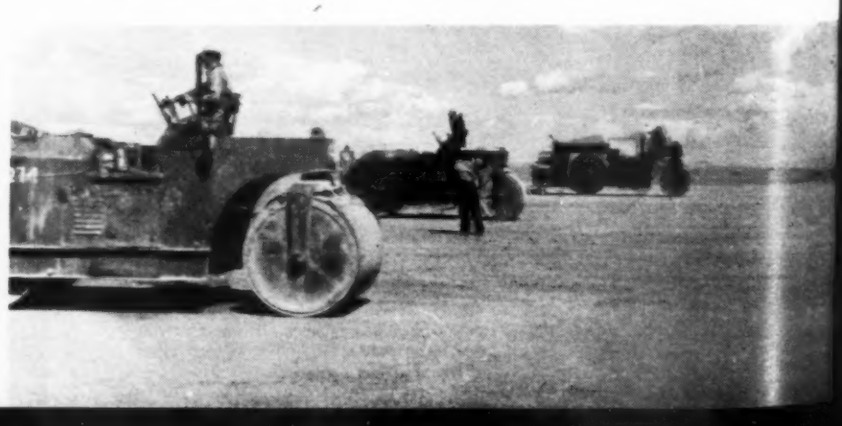
Quarrying, Processing, Stockpiling Crushed Stone for Runway Base and Hot-Mix Topping

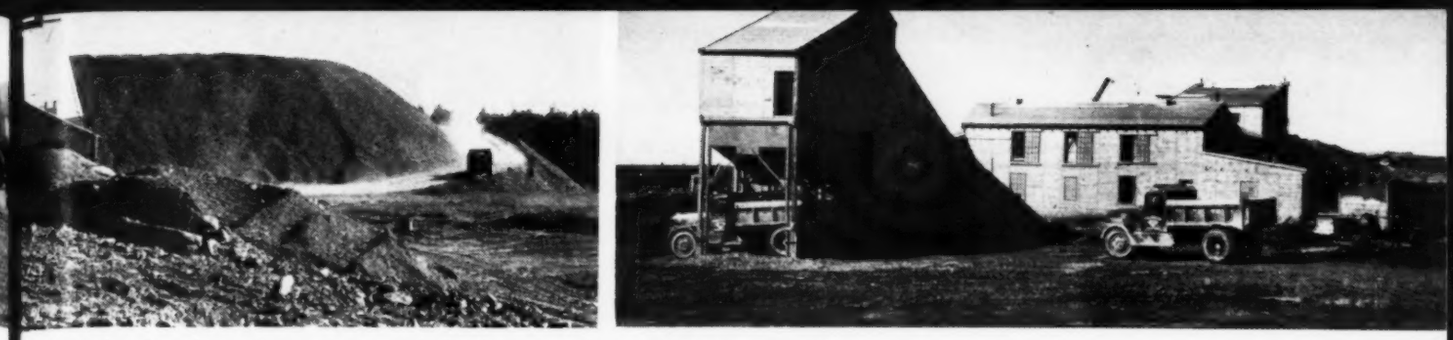
★ The quarry was worked by a Northwest 2½-yd. shovel and Euclid rock trucks

★ Three 10-12-ton ballasted Galion rollers, compactigg choked stone base course. New 21-ton rollers were later brought in to secure utmost density for stone base and hot-mix

★ (Above Right): Air for the quarry drills was distributed around the rim of the quarry through a 4-in. trunk, with 2-in. lines leading to individual drills

★ (Left): Preparing an 1850-lb. charge, involving 79 holes averaging 26 ft. depth. About 0.8 lb. of 40% gelatine dynamite was required per c. y.





★ Enclosed crusher and stone being stockpiled for runway base and hot-mix aggregates

were well housed and fed, at a cost not exceeding $2.75 per day, which with the 60-hour week gave those willing to stick a chance to make good money. A large trailer camp housed 50 men and their families, who were given water, electricity and sanitation facilities at reasonable rental rates.

Turnover of workers has been high, but this emphasizes an opposite fact in the contractor organizations; namely, the large number of 15 and 20 year men running the job. Lane, particularly, credits much of its success in job management to these seasoned veterans.

The force of 1500, more or less, is bossed by 9 superintendents, 11 assistants and nearly a hundred foremen. Of special interest is the shop and service organization under John Coburn, a Lane veteran. His staff consists of 3 equipment managers—one each in shop and field in daytime, and one for all work at night—and a peak of 240 men comprising 2 master mechanics and 2 assistants each shift, mechanics, mechanics' helpers, oilers and greasers, and specialty men.

Servicing the equipment in the field are five grease trucks with high and low pressure lube lines; 2 oil supply trucks for the field and yard (most oil changes at night); 2 compressor trucks with tire changing equipment; one truck with heavy crane for lifting off big tires; one wrecker for towing in broken-down equipment; several trailers for moving equipment about. Incidentally, there were 1700 tires in service as of August 1.

★ Blasting, all the way, was necessary to trench for the 16-in. water mains from the reservoir

A motor pool centered in a six-bay truck establishment, two bays having high-level racks for big trucks. Across the road and in a big yard surrounded by a sea of booms, rigs, stashed parts and out-door goings-on, is the 120 x 160 main shop, where hundreds of overhauls have been performed in the spacious departmentalized interior, aided by complete machine shop equipment.

The project is being designed and built under the direction and supervision of Brig. Gen. Raymond G. Moses, division engineer of the New England Division, Corps of Engineers, and his staff, including Lt. Colonel G. W. Carlson, assistant to the division engineer; John E. Allen, chief of the engineering division; John W. Leslie, chief of the military design branch; Christopher J. Murray, chief of the operations and construction division; Carl J. Lovejoy, asst. chief of operations and construction division; and Harold G. Gamble, chief of the military construction branch.

Robert E. Lee is resident engineer at Limestone and D. M. Mills, assistant resident engineer, E. D. Moore is project manager for the joint contractors and H. W. Davis assistant project manager. Frank A. Davis is general superintendent for T. W. Cunnningham, Inc., whose primary work is building the hangar and other structures. J. H. Wylde is general superintendent for Lane Construction Corp., C. E. Goodall, asst. superintendent, and C. B. Lewis, supt. of plants. The Lane end is primarily to grading and paving and this firm furnished all the plants and most of the heavy equipment.

Shop facilities and field servicing at Limestone will be pictured in a forthcoming issue of ROADS AND STREETS.

Some of the Equipment at Limestone

(assorted makes unless otherwise specified)

- 175 trucks (including 14 converted 4wd. army weapons carriers, for field repair trucks)
- 95 crawler tractors (Caterpillars, mostly)
- 13 self-powered scrapers (LeTourneau)
- 15 tractor-drawn scrapers (LeT)
- 16 motor graders
- 15 steel wheel rollers
- 14 sheepsfoot roller units (mostly 3-drums, single axle)
- 2 pneumatic-tired super compactors
- 3 35-ton earth-moving buggies
- 38 bottom-dump wagons (Euclid)
- 6 rear-dump rock trucks (Euclid)
- 2 power loaders (Euclid)
- 26 shovels and cranes (up to 2½-yd.)
- 19 air compressors (mostly 315's)
- 2 gravel washing and crushing plants (200t. rated combined capacity)
- 1 stone crushing and screening plant (200 t. per hr.)
- 2 hot-mix plants (70 t. per hr. each)
- 2 cement silos
- 1 concrete batching plant
- 2 locomotives (GE 30-ton diesel electric)
- 4 transit-mix trucks (Ransome)
- 2 27-E pavers (used as stationary plants for hangar)
- 2 bituminous finishers (Barber-Greene, Jaeger and Adnum)
- 32 trailer-mounted gasoline-powered generators with flood lights
- 10 welding machines (4 mobile)

●

Skyway Named for Whitehurst—A new skyway at Washington, D. C., has been named the Whitehurst Freeway to memorialize Capt. H. C. Whitehurst, District of Columbia highway director, who died Sept. 1. The elevated freeway, now under construction, runs through the congested Georgetown area of the capital.

AASHO Meeting at Salt Lake City

Our Pace Must Be Doubled

. . . in interest of national economy and security, is warning of highway leaders

WE are waging a losing battle against traffic-wear and obsolescence on the Nation's highways, reminded president R. H. Baldock at the annual meeting of the American Association of State Highway Officials. Held Sept. 19-24 at Salt Lake City the meeting was attended by 700 delegates and visitors.

Recalling a nation-wide study made in 1947, the Association's retiring president stated that a capital outlay of four billion dollars annually is needed for at least five years *to meet critical highway deficiencies alone.* In blunt language, Mr. Baldock presented a devastating picture of how fast we are falling behind in the road building job, and how urgent is the need to analyze the problem state by state and promote sound tax legislation to create new road revenues.

★ Wesley W. Polk

May Lose Fed. Aid

If lagging states continue to leave their federal-aid allotments unmatched, he observed, Congress will rightly question the need to continue even at the present $450,000,000 annual federal-aid level. But if the lagging states do get busy, congressional leaders have assured that in 1952 there is a good outlook for a new act increasing this sum. A billion dollars annual federal aid will likely be sought by state highway officials and the Public Roads Administration, to offset our fifty-cent devaluated dollars.

Meantime, latest figures indicate that over $400,000 in federal-aid funds will be disbursed this year—a new dollar record—and that a probable $1,700,000,000 will be spent for road construction from all sources, as against $1,250,000,000 in 1947.

President Baldock stirred the fires of what continues to be a hot controversy by recommending that relatively more funds be concentrated on the arterials which are rapidly wearing out under growing traffic. This statement was undoubtedly prompted by the persistent activities of pressure groups, state and national, to bring about a further dispersion of state-collected road funds to counties for secondary and feeder roads and to cities for local streets.

Other speakers on national topics included Maj. General Philip B. Fleming, federal works administrator; Thos. H. MacDonald, public roads commissioner; and Hon. Will M. Whittingham, member U. S. House subcommittee on roads.

Administrative Lag

Speaking from the ripe wisdom of nearly a third of a century of leadership, commissioner MacDonald dwelt on the need for better administrative direction of highway work. "The lag is greater in perfecting administrative organization than engineering techniques," he noted. "In the long run the results will depend more on the quality of administration than upon accumulated engineering knowledge, which is the servant and not the master of highway destiny. Progress in highway engineering goes on at an accelerated pace, in sharp contrast with the lack of perfection in administrative policies and tools."

Realizing that a "transit back sight" is needed at this point, the commissioner reviewed past and current administrative policies and problems as a means of looking to the future.

Some of his findings:

F. A. "Small Potatoes"

(1) Federal highway aid actually disbursed in 1947 represented only 14% of the total national expenditure for highway construction and maintenance, and this figure would have been only 20% had the year's full rate of expenditure been realized—quite a different picture from the one presented by hostile witnesses at recent congressional hearings, claiming that federal participation in roads should be reduced as an economy and an anti-inflation measure. Less than 3% of the national income was spent on roads, and of this less than 1% was federal.

An annual $500,000,000 federal highway participation represents only a penny per day per citizen!

(2) As an operating plant the nation's highway system is a giant. Motor vehicle transportation as an industry represents over 12 billion dollars annually, or 7½% of the national income. Road construction and maintenance are the operating phase of this industry. An accelerated program of capital replacement in the highway

plant is true economy, since the time will fast come when any number of maintenance dollars will not keep worn-out roads in service.

(3) The increase in highway construction costs is not out of line with price trends in other commodities and services. Those who would curtail road work in the interest of economy and deflation fail to realize that road construction represents only one-tenth of all current construction, to say nothing of its infinitesimal part in the nation's total spending. We should however continue to seek to eliminate unnecessary high-cost items from road construction, and let projects cautiously on a basis of urgency. Road expenditure should not be expanded too abruptly in view of the shortages in engineering personnel and materials. Contractors will respond with lower bids when programs are expanded smoothly but steadily, rather than "feast and famine."

Since the war we've completed nearly 27,000 miles of federal-aid projects and 18,000 miles more are under construction or contract, continued Commissioner MacDonald. Adding "programmed" and "plans-approved" projects, the postwar accomplishment embraces 64,000 miles, or over 10% of all primary and secondary roads. Reason for pride—yet the pace is far behind the need.

In any given year, in order to assure good conditions for contractors, about 60% of the annual apportionment should be contracted for and remaining to be done, in order to accomplish a year's work equal to the year's apportionment. In an expanding program, such as is needed now, this figure should be 70% or more, and still higher where considerable urban work, with its inherent lag, is involved.

The rate of contracting should be governed by the capacity of the highway department to administer and provide proper engineering control, and by the capacity of the contracting industry to complete quality work on time.

(4) New patterns crystallized by the 1944 act were summarized by Commissioner MacDonald. He described this act as a basic revision of the federal law, adjusting to a three-fold current need—primary, secondary and urban. Because of its soundness, our present federal law is "not subject to informed attack."

(5) Road planners must recognize population distribution trends, such as the trend cityward and the development of satellite communities around big cities. If the highway framework is soundly planned, community growth will be automatically adjusted to arterial systems.

New AASHO Officers and Directors

President: Wesley W. Polk, chief engineer, Illinois division of highways.

1st Vice Pres.: Carl W. Brown, chief engineer, Missouri state highway department.

Regional Vice Presidents: Spencer Miller, Jr., N. Jersey; W. Vance Baise, N. Carolina; Charles M. Ziegler, Mich.; A. F. Winkler, Montana.

Treas.: G. H. Henderson, R. I. (re-elected).

Exec. Committee: D. C. Greer, Texas; J. A. Anderson, Va. (5-yr. terms); B. D. Tallamy, N. Y. (for unexpired term of C. H. Sells); M. J. Hoffman, Minn. (for unexpired term of C. W. Brown).

Maintenance, Big Business

A general-session panel discussion on maintenance, followed by an all-day committee session on maintenance and equipment, brought out many interesting facts. Under R. H. Baldock of Oregon as chairman the meeting repeatedly brought expression of the need for more capital investment in roadbed reconstruction to help cut down sharply increasing repair and upkeep costs. Maintenance now takes over half the available road money in many states. The national road maintenance bill was $1,080,000,000 in 1947 and will be still higher this year.

A more far-sighted policy in maintenance was urged by D. C. Greer of Texas. On "Preventive Maintenance" he said that frequently roads are built with faulty drainage, slippery surfaces and poor foundations, resulting in early repair expense. A closer harmony between maintenance and construction divisions of the highway department will mean more durable roads requiring less upkeep. Many states including Texas have worked out specific procedures to follow during the design and construction of a project, to insure such cooperation.

In Texas the practice is to get design and construction men together with county maintenance foremen and travel the job with the resident engineer, before and during design and again during construction. Technical men can learn much from local maintenance foremen.

Area rather than jurisdictional types of district road maintenance for different classes of roads was advocated by J. A. Anderson, commission chairman, Virginia. This of course would require that all classes of roads be under one organization, the case in Virginia. Compared with the old overlapping state-county setup, a saving of 32% is being realized in Virginia, due to a reduction in equipment and men needed for a given quality of maintenance. Existence of both state and county owned garages entails deadheading equipment over each other's roads and unnecessary duplication of shop and storage facilities. Another key to economy lies in the cutting down of the travel radius out of each garage.

Noting that it now requires $1.02 equipment investment for each $1.00

★ Are you in the picture? Official AASHO photograph at Salt Lake City

Resolutions at the Highway Officials' Convention

1. (Reaffirmation) That each state undertake the development of a long-range highway plan "so essential for effective economical state and national highway administration."

2. That the states take positive action to expedite that part of its program that may be causing delays, in order to speed currently authorized construction programs, by (a) ascertaining retarding factors and correcting them, (b) establishing adequate salary scales for highway department employees, (c) adopting a sound personnel policy affording advancement opportunity and retirement benefits, (d) maintaining contact with colleges and universities to encourage student interest in highway work.

3. That the burden of financing highway construction and maintenance should fairly be borne by highway users, benefitted property owners, and general public, substantially in proportion to benefits received.

4. That state legislatures investigate all possible ways of providing more money to meet current budget needs and "thus permit highway departments to discharge their responsibilities."

5. That federal laws be amended to provide for bridges in or near reservoirs where the federal constructing agency finds that a bridge on the dam is not feasible.

6. That Sec. 14 of the Federal Highway Act (of 1943) be amended to provide that the responsibility to maintain secondary or feeder roads, and roads in urban areas as defined in the 1944 Act, constructed under the provisions of said acts, as amended or supplemented, shall be the duty of the States or their Civil Subdivisions according to the laws of the Several States; and further that any penalties imposed for failure to adequately maintain such roads shall apply to the subdivisions where the State is not responsible for such maintenance; and the Congress is hereby requested to enact such legislation as it may deem necessary for this purpose.

7. That the AASHO recognizes the urgency of the study of the status of the Inter-State Highway system, as directed by Sec. 2 of the 1948 Act in the interest of national defense, and pledges its full support.

8. That the AASHO seek appropriate amendment to the Federal Power Act to reserve certain highway rights or privileges through power project areas and make road relocation costs a part of the power project under certain conditions.

9. That the Association's executive committee be given power to act on a bridges and structures committee resolution to make a study of bridge needs related to federal navigation requirements, and seek legislation needed to ease the present problems PRA now faces in locating bridges over waterways.

10. That the Federal Communications Commission be asked to expedite radio telephone installations for highway work by the prompt publication of its rules in definitive form and by providing sufficient and suitable frequencies.

of annual maintenance on arterial roads and $1.28 in equipment per work dollar on secondary roads, commissioner Anderson went on to show the high place of mechanical equipment in road upkeep today. An average 10,000-mile road "package" recently analyzed by PRA requires annually for upkeep: 2,538,000 miles of operation by autos and pick-up trucks; 753,574 hours of truck operation; 186,692 hours of grader operation; 58,000 hours of mower work; and 36,000 hours of tractor work. Large use was also indicated for bituminous distributors, aggregate spreaders, power brooms, loaders, shovels, road rollers, snow equipment, etc.

Spring Load Limits

A new and serious interpretation of the spring-thaw problem was presented by Minnesota commissioner M. J. Hoffman in general session and this state's maintenance engineer C. L. Motl later in committee. Minnesota has learned it had to clap load restrictions on state truck routes each spring. Truckers then use the secondaries. A law passed in 1946 now limits axle loads to 4 tons on all secondaries from March 20 to May 15, except on routes specifically exempted. Limits are also posted by the highway department on state trunk roads where deemed necessary. Of the 11,000 miles of rural trunk routes, 3,000 are paved and the remainder are bituminous and gravel. Some 7,600 of the 8,000 miles of the latter have had to be posted with limit ranging from 3 to 7 tons. A load-test program has shown that flexible type roadbeds lose from 50% to 60% of their load carrying capacity during the thaw period.

The restrictions imposed keep back only 5% of the motor vehicles for two months each year—but in so doing will help preserve the highway system and save vast sums which will become available for road betterment and new projects.

This rigorous program at first brought yells from truckers, but a season or two of experience showed them that they gained back the time lost by being able to enjoy unimpaired roads all summer. "Test" sections purposely left unrestricted soon made themselves impassible, requiring detours for heavy repairs after the thaw period, demonstrating dramatically that restrictions are in the trucker's interest as well as the taxpayer's.

Dual rear axles are proposed for school buses, which are a critical problem and represent one of the biggest groups of heavy vehicles. Legislation may be necessary here.

Radio Use Expanding

Radio telephone's possibilities in management of road construction and maintenance continues to be a live subject. Clarence B. Shain, director of highways, Washington, described his state's experiences, stressing the value of radio in rendering better public service throughout the year.

W. K. Myers of Pennsylvania said that it is more economical for a department to own and maintain its own radio equipment.

Big radio progress has been made in the past 12 months, this service now having its own frequency allocation and having been lifted out of the emergency class. T. H. Dennis, first chairman of the radio committee, and Myers his successor, were praised for their work.

Maintenance personnel problems were discussed in several papers. Roy W. McLeese, chief engineer, Utah, told of his department's training program, which involves the successful use of "how to do it" movies for foremen on patching and other tasks. It is now planned to show the pictures to the entire crews.

A progress report was again made by the joint maintenance personnel committee, Highway Research Board and AASHO, and it was voted to continue the work of this committee. The report analyzed the factors that attract and hold men to their jobs, as found in a recent study made by the National Industrial Conference Board. These factors include not only good pay and assurance of continuity of service, but also opportunity for advancement, type of work, and—this is particularly significant—the worker's knowledge of "how he is doing." The committee brought up to date its tabulation of pay scales for various duties in the different states. Considerable disparity in pay for comparable work still exists, beyond that accounted for by regional living costs and conditions and size of programs. The pay of state maintenance engineers ranges from

Space limitations prevent reference to all the excellent papers on maintenance. Committee and panel sessions were also held at Salt Lake City on roadside problems, bridges, traffic, uniform accounting, public relations, administrative practices, construction, factual surveys, materials, legal affairs, right-of-way, and on groups of related subjects. Selected papers, reports and reporter-notes will be presented in subsequent issues of ROADS AND STREETS.—**Editor**

$370 to $1045, for example, and average mechanic pay varies from $173.33 to $310 per month; skilled labor from $138.50 to $277.

D. N. Stewart, maintenance engineer, Colorado, read a committee report on standardization of flasher and warning lights on maintenance equipment. Two years' effort has been given to this matter, there still being no uniform official method of lighting of snow plows and other equipment. A list of lights in a proposed uniform requirement was presented, after which the delegates discussed some of the obstacles in the way of early uniformity. One of these is the existence of laws in certain states banning flashing lights on anything except railway crossings, etc. Flashing lights are already in use in 23 states, however, and the outlook is good for early standardization.

Fewer Road Workers

Between 1936 and 1947, the ranks of state highway maintenance workers have dwindled 36,000, meaning that each worker now has 40% greater mileage to cover, noted Thos. H. MacDonald in discussing the public-service aspects of road upkeep. Including cities, counties and other local road agencies, the drop is 71,000 men. Increased mechanization has not enabled this reduced force to keep maintenance to the needed level with available funds. During this period motor registration has jumped 60%, travel 79%, and traffic in ton-miles 120%. Maintenance unit-costs have risen 84% in the period.

A survey recently showed that state road departments expect to purchase $98 million in new maintenance equipment before the end of 1949.

The 327,000 road maintenance workers now employed represent a large army, able to render vital service in event of storm, flood, and other possible disasters. And their deportment is a powerful means of building goodwill for the highway department.

Materials-Construction Session

A joint committee session on materials and construction problems, with C. M. Hathaway, Illinois, and F. V. Reagel, Missouri, as chairmen, began with a summary by director Roy W. Crum of the Highway Research Board's now-established correlation service and its other activities. Over 70 committees with 650 members today carry on the Board's work. Mr. Crum observed that there is no mystery in research, but that it is merely the work of "proving what we're doing now is good, or finding out what we're going to do when we can no longer do what we're doing now." A. W. Johnson, of the HRB staff, took listeners through a hypothetical problem in embankment consolidation, to show the complexity of this subject and show how laboratory soil test data can be utilized during construction, especially to determine the relation between compactive effort and various densities.

A discussion of compaction procedures that followed revealed a continued wide variation in state specifications. One speaker suggested that highway departments could get cheaper results by lowering their requirements from 95% down to 90%. There are many more working days each season in which the contractor could then proceed with confidence, and experience shows that when he tries for 90% he actually achieves nearer 95% much of the time anyway.

F. H. Jackson of PRA in Washington stirred great interest by suggesting that we may come to very much stiffer, dryer concrete mixes in pavement construction. Present dissatisfaction with the use of vibrators, he noted, are due largely to the fact that vibration is employed in relatively wet mixes. The excellent durability record of the German *autobahn* roads is credited partly to the use of zero-slump mixes. With such mixes vibrators would be more in the nature of compactors. The greatly increased strength and durability of concrete so made should challenge highway engineers to devise techniques for this country.

AASHO-AGC Committee Report

USE of the contract method for the large secondary highway construction program now in progress is proving successful in all parts of the country. This was the conclusion at the Joint Cooperative Committee of the American Association of State Highway Officials and the Associated General Contractors of America, after meeting Sept. 19 at Salt Lake City. Contract work for the secondary program is proving more economical than the state highway force-account work, it was revealed at the conference, which was held as part of the annual convention of the AASHO.

To make the contract method most effective for this type of construction, many states are awarding a number of nearby projects as one contract. Other methods were cited for making work more attractive to contractors, such as awarding the grading as one contract and the paving as another.

Good Competitive Bids

When done by contract, secondary road construction was seen of great importance in providing work for small contractors who after a few years of experience would be able to undertake much larger projects, thereby increasing the capacity of the country's contracting industry.

Good competitive bids are now being received in almost all sections of the country for projects on both the primary and secondary systems, the committee further found. For example, at recent lettings for 362 California projects to have a total cost of $67,000,000 the bids for $50,000 jobs and smaller averaged 4.5 bids per project; for $50,000 to $100,000, 5.2 bids; $100,000 to $250,000 projects, 6.6 bids; $250,000 to $500,000 jobs, 7.4 bids; $500,000 to $1,000,000 projects, 7.0 offers; and above $1,000,000, 7.4 bids. The average for all projects was considerably above the number received several months ago on similar work and was seen as adequate to assure good competition. Other states reported receipt of a large number of offers, but a few reported less competition on jobs calling for special construction.

Appreciation of the advantages of the contract method for highway construction was further indicated by a recent PRA survey. This work revealed that of 1.6 billion dollars of road construction under way or recently completed with federal aid, only 0.7 of one per cent was being carried out with day labor. However, although no figures were available, many present reported that some counties were carrying out a larger proportion of their programs by force account where no

federal funds were involved. This condition prevails because of the very nature of some jobs and the failure of the contracting industry to take an interest in these programs.

Planning Ahead Pays

Even better bids will be received if the state highway departments prepare their construction programs sufficiently ahead of time so that the contractors know the total volume of various types of work to be carried out during a given construction season. This practice, several states have found, encourages the contractors to assemble adequate plant and personnel and prevents the contractors from leaving home to work in adjoining states. This procedure has also proven effective in a number of states in assuring an adequate supply of materials, as producers feel safe in expending their production facilities.

Many states also reported they had found that a variety of jobs at a given letting, in size and to type of construction, adds more interest in each letting and results in an increased number of bids.

Discussion of the standard general provisions in highway specifications now being prepared by the AASHO revealed that good progress is being made. The contractors were reassured that the AGC would be given ample opportunity to comment on the provisions, once the work had advanced sufficiently. Representatives of both the state highway departments and the PRA also stressed that the general provisions were being prepared as a guide only and that the states would continue to use specifications best suited for different regions.

The Joint Committee renewed its pledge to strive for a long-range continuing highway construction program, which was seen as offering major benefits to not only the contractors and highway officials as well, but also great benefits to the American public. The committee will also continue to work for better pay for highway engineers and officials and for inducing more young engineers to enter highway work.

State Committees Effective

Recent organization of Joint Cooperative Committees at the state level was reported by several states. Much beneficial work by these groups was described.

W. Vance Baise, chief engineer, North Carolina state highway department, presided. State representatives present were: R. H. Baldock, Oregon; Roy W. McLeese, Utah; James J. Corbett, Missouri; W. A. Williams, Delaware; M. A. Wilson, also Delaware; G. T. McCoy, California; and C. M. Hathaway, Illinois.

Other state highway personnel present were: W. C. Lefebvre, Arizona; DeWitt C. Greer, Texas; J. H. Archer, Georgia; M. L. O'Neale, West Virginia; W. A. Warrick, Pennsylvania; C. R. Waters, New York; Richard H. Wilson, California; and G. S. Paxson, Oregon. PRA was represented by A. C. Clark, chief of division of construction, Washington, D. C.

Contractors present were: Morris E. DeWitt, Porter-DeWitt Construction Company, Poplar Bluff, Mo.; Thomas H. Joyce, Jr., Joyce Brothers Contracting Company, Springfield, Ill.; George C. Koss, of the Des Moines, Iowa, firm of the same name; Grant Thorn, of A. O. Thorn and Sons Construction Company, Provo, Utah; and, Edward Clyde, of the W. W. Clyde and Company, Springville, Utah.

Contractor's representatives present included: Allan E. Mecham, manager-counsel of the Intermountain Branch of the AGC at Salt Lake City; M. F. Russell, assistant to Mr. Mecham; A. H. Harding, manager of the Portland, Oregon, chapter, AGC; and A. N. Carter, manager, Highway Division, AGC, Washington, D. C.

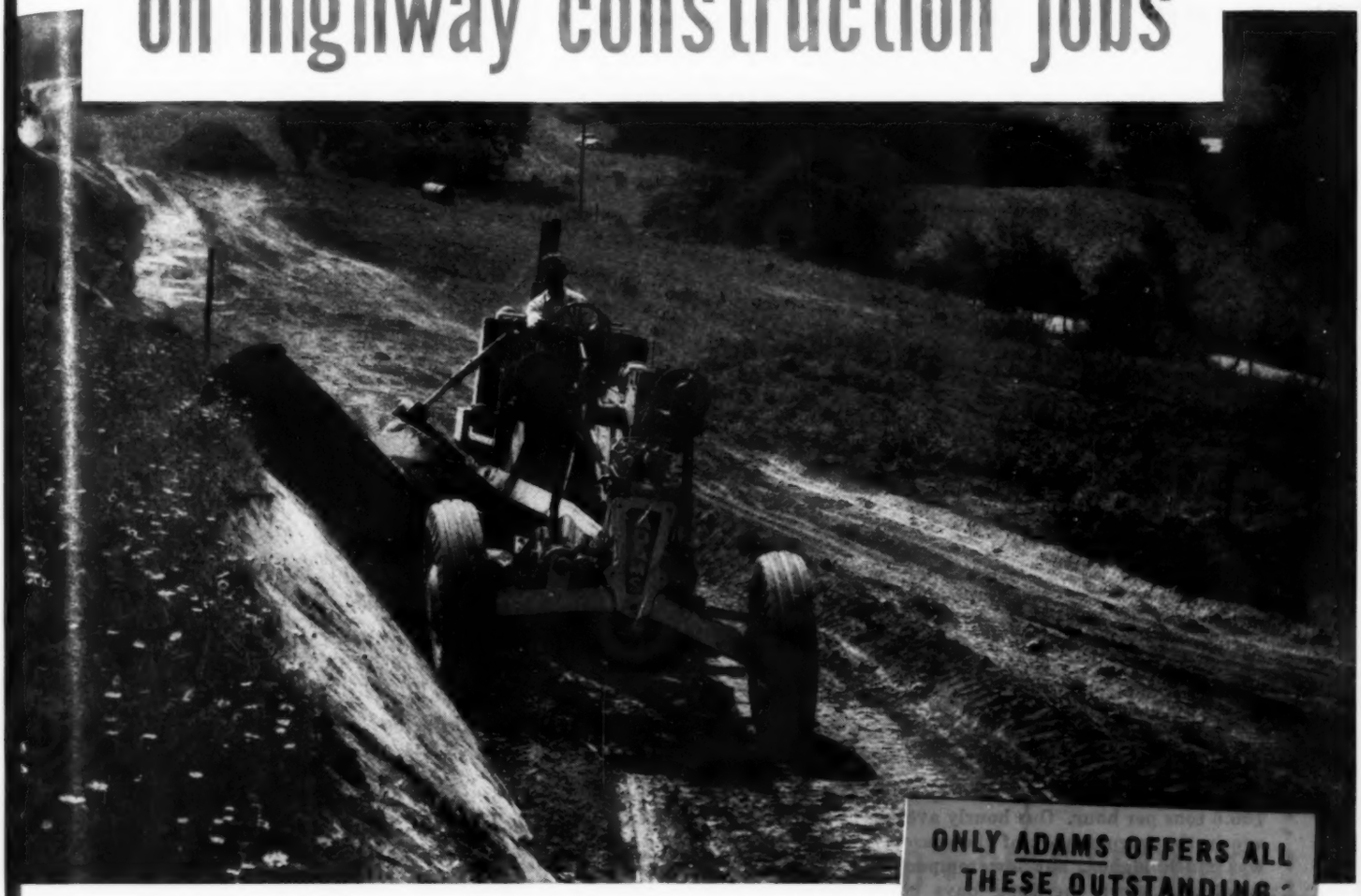
The next meeting of the Joint Cooperative Committee will be held November as part of the annual convention of the Southeastern Association of State Highway Officials. This convention is scheduled for Edgewater Park, Mississippi.

"I HOPE YOU DON'T MIND — I JUST WANT TO GET THE FEEL OF THIS NEW MODEL—"

Oakes and Scott for Moles Awards

The Moles, New York Society of tunnel and heavy construction men, have selected two nationally-known contractors, Luther S. Oakes of Minneapolis, and Thomas A. Scott of New York City, as recipients of the 1949 Moles Award for outstanding construction achievement. The awards will be presented by Moles President J. Rich Steers at a dinner meeting Feb. 9 at the Waldorf-Astoria Hotel in New York. Luther S. Oakes has been president of Winston Bros. Co., Minneapolis, Minn., for 27 years. Capt. Thomas A. Scott has been a contractor since 1902, when he organized the T. A. Scott Co. of New London, Conn., with his father. In 1922 he consummated the merger of the T. A. Scott Co. with Merritt-Chapman Derrick & Wrecking Co. under the name of Merritt-Chapman & Scott Corp. of New York City. He served as president for many years, and is now chairman of the board.

Adams advantages pay off on highway construction jobs



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105.6 Tons of Hot-Mix Per Hour

Granite Bituminous Paving Company averaged this tonnage on 25-mile resurface project in Missouri

APPLYING hot-mix to resurface old pavement is the kind of work that can go fast when everything is just right. And it can also be slowed up by innumerable factors such as bad weather, equipment breakdowns, etc.

One of the speedier runs that we have heard about recently is that reported by James N. Ozee, vice president of Granite Bituminous Paving Company of St. Louis, for a job this company finished on US Route 50, Missouri, in late-summer, 1947. We quote Mr. Ozee as follows:

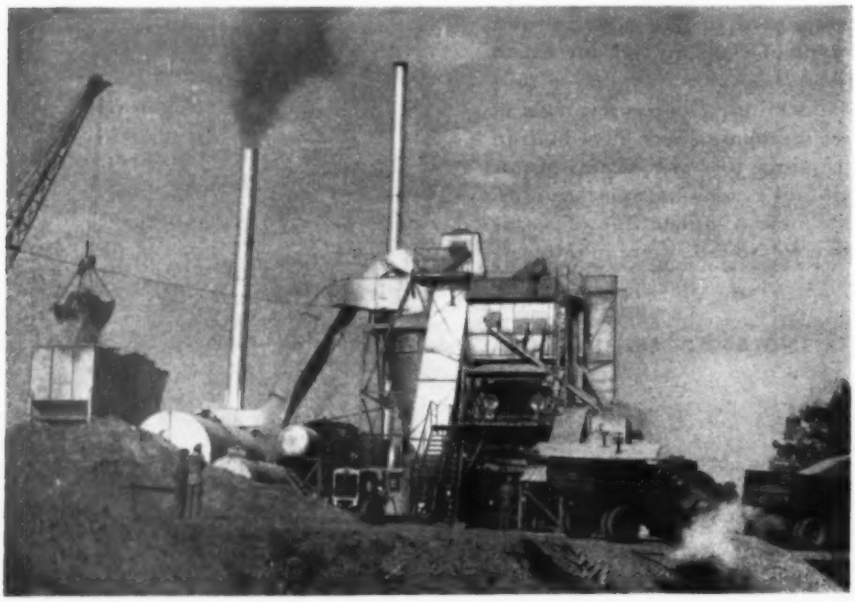
"The contract included the resurfacing of old concrete slab with bituminous concrete mixture 4 in. in thickness and 20 ft. in width, from Leslie, Mo., to Drake, Mo., a distance of 31.8 miles with an exception near the middle of the project of 6.4 miles. The area actually paved was 25.385 miles in length. We laid a wedge or leveling course, a 2¾-in. thickness binder course and a 1¼-in. thickness surface or wearing course. We laid a total of 68,111 tons of mixture on this project. It required 645 hours of actual operating time or an average of 105.6 tons per hour. Our hourly average in the warmer part of the season was much higher, but low temperatures and short operating days cut this average tremendously during the month of December. Our best daily average was 146.6 tons per hour for an eight-hour day on September 20, 1947. Our largest tonnage for one day was 1,380 tons in a 10-hour day on September 18, 1947.

"The bituminous mixture was mixed with a No. 902 Warren Brothers Asphalt Plant, with a 5,000-lb. capacity pug mill mixer. We used Barber-Greene finishing machines, an Erie tandem roller and a Buffalo-Springfield tandem roller. Roy Puckett was superintendent on the job for our company, assisted by Albert A. Thompson, Vernon Bolles and James Noel. The State of Missouri was represented by Dewey Conrad, construction engineer, and J. C. Burgesen, project engineer."

675,000 C. Y. in 82 Working Days

Another example of the kind of pace everyone likes to see on road work was reported by McDonough-Millett Company, St. Paul, Minnesota. This contracting firm, during 1947, graded 8 miles and placed stabilized gravel and did other work on Minnesota Route 1901-04. The "other work" included 46,000 sq. yd. of sodding, 10,000 c. y. of stabilized gravel, 3700 lin. ft. of corrugated metal culvert, and 2800 ft. of culvert of other types. The roadway was built 38 ft. wide, with 4 in. of stabilized base and 3 in. of stabilized surface.

In addition to all the other work, the contractor completed the main item of 675,000 yd. of unclassified excavation in 82 working days of 10 hours each. His outfit included four 20-yd. LeTourneau scrapers and for the last one-third of a job, two 30-yd. LeTourneau scrapers in addition. There were three push tractors and two bulldozers.



★ Hot-mix plant of Granite Bituminous Paving Co.

Recruiting Draftsmen

H. E. Bailey, State Highway Director of Oklahoma, has announced a plan to recruit graduates from high schools to attend an 8-weeks' course for draftsmen at the engineering school of Oklahoma A&M College Stillwater, Okla.

They will be placed on the State Highway Department payroll at a salary that will provide for their requirements during the school term. Upon successful completion of the course, the trainee will be taken into permanent employment at the Oklahoma City headquarters at a substantial increase in pay.

Short Courses for Road Men

The Oklahoma State Highway Department has arranged special training courses in soil mechanics at Oklahoma A&M College for its inspectors, field men, resident engineers, laboratory technicians and design engineers, commencing in November and extending into February. There will be three 2-week periods for this type of education.

During December and February, inspectors and engineers will take two weeks education on asphalt, while in March inspectors and field men will take a 2-week short course in concrete inspection.

Coming Meetings

Highway Research Board, annual convention; Washington, D.C.; Dec. 6-10.

Associated Equipment Distributors, annual convention; Chicago; Stevens Hotel; Jan. 16-20.

National Crushed Stone Assn., 32nd annual convention; New York; Hotel New Yorker; Feb. 7-9.

National Ready Mixed Concrete Assn., 19th annual convention; New York; Hotel New Yorker; Feb. 14-18.

National Sand and Gravel Assn., 33rd annual convention; New York; Hotel New Yorker; Feb. 14-18.

Associated General Contractors of America, Inc.; annual convention, Waldorf-Astoria Hotel, New York City, Feb. 28-March 3.

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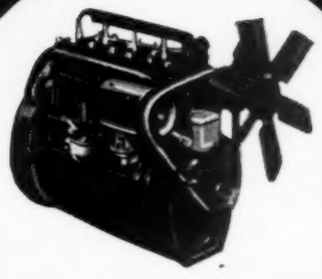

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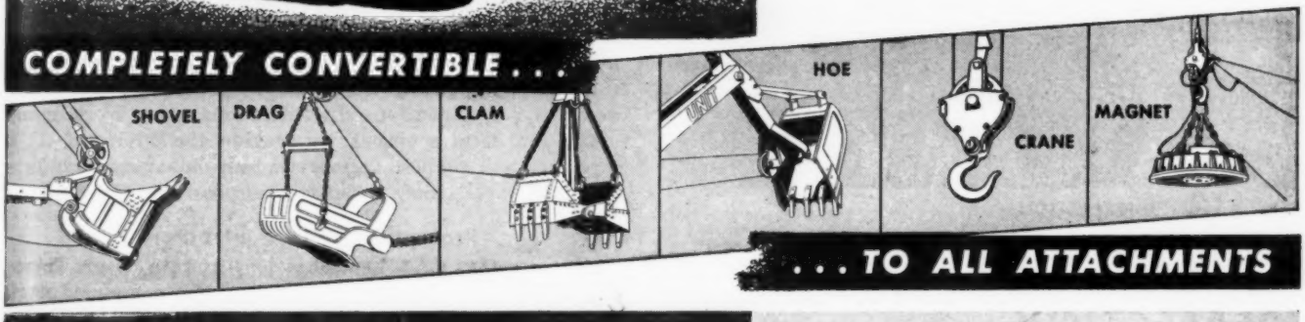

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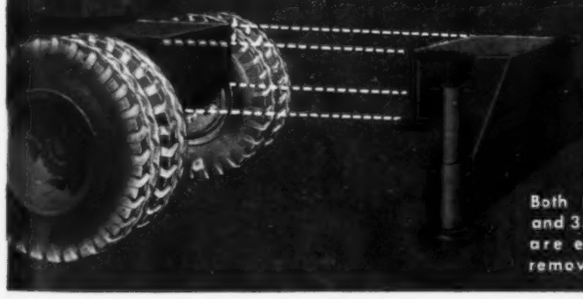

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Joint Aviation-Contractor Committee Meets Again

By A. B. McMullen
National Association of State Aviation Officials and
A. N. Carter,
Associated General Contractors of America, Inc.

THE new specifications prepared by the Civil Aeronautics Administration for the National Airport construction program are a good guide when the sponsors of a federal-aid project prepare its specifications, the Joint Cooperative Committee of the National Association of State Aviation Officials and the Associated General Contractors of America concluded at a meeting October 6 at Boston, Mass. However, the meeting, which was held as part of NASAO's annual convention, also revealed that to make the specifications most satisfactory they must be modified to meet local conditions.

CAA engineers present pointed out that the new specifications are not mandatory for the one billion dollar construction program now underway. They are intended as a helpful guide only, and much study and research went into their preparation. Some states reported that they were following the specifications rather closely, but other states are preparing their own by combining the best features of that state's highway department specifications and the new CAA specifications. In this preparation work many states and local sponsors are seeking the advice of AGC members and chapter secretaries and managers to assure the most satisfactory specifications possible.

Prompter Pay to Contractors

The fact that CAA's specifications contain no provisions for the prompt payment to contractors for completed work was considered at some length. The committee concluded that slow payment by the sponsors results in higher construction costs and that the contract proposals should call for the payment of contractor's estimates within 30 days after they are submitted or whatever other period is determined reasonable. CAA representatives present agreed that addition of such provision in its new specifications or in the actual contracts would be worthwhile and that when they returned to Washington such action would be recommended.

Much enthusiasm was shown for the work accomplished at the regional meeting of the Joint Cooperative Committee at Seattle, Wash., July 20. As a follow-up of that meeting Richard T. Puckey, superintendent of the airport branch in CAA's regional office at Seattle, issued instructions to sponsors in that area that greatly simplified the prequalification of bidders.

The general provisions formerly used generally contained a section reading: "and a statement of financial resources, dated within thirty days prior to the date of opening of bids." Impressed at the Seattle meeting with impossibility of most contractors to submit a financial statement so up-to-date, Mr. Puckey issued instructions terming this provision illogical and almost impossible for the contractor to meet.

Instead of this provision his office has recommended to sponsors the use of the following language: "and a certified statement as to his financial condition as of December 31, of the year preceding the date for the call for bids, or as of the end of the fiscal year on which he operates. It is understood in all cases that such statement remains effective for a period not exceeding fifteen months."

By use of the 15-month period, contractors will be allowed time at the start of a new year to prepare a new statement.

Nation-wide "Spec" Change

CAA representatives at the Boston meeting assured the committee that all CAA regional offices would be instructed to take action similar to that taken by Mr. Puckey's staff.

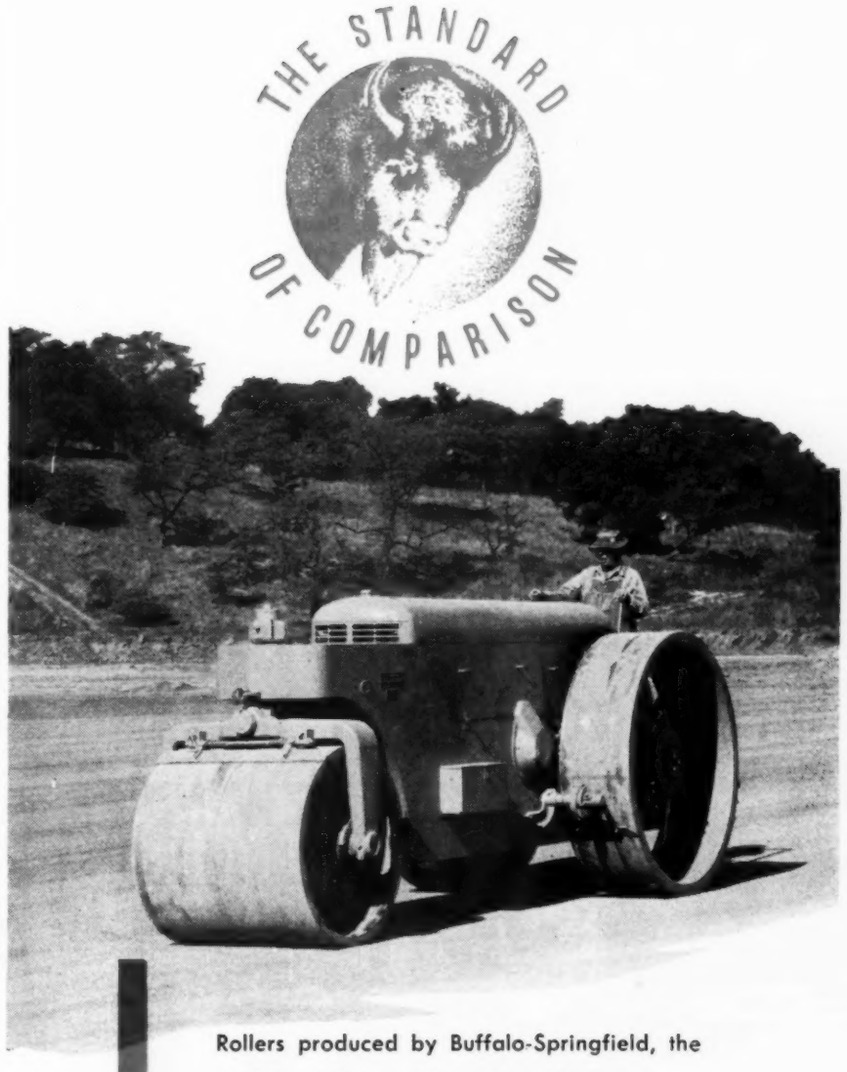
In further discussion of the prequalifications of the bidders, the committee agreed that benefits to the airport program would result if prequalification work included consideration of the amount of equipment the contractor has available to carry out a given project. Financial condition of the bidder was termed important, but the possible delay the contractor might encounter in securing adequate equipment and personnel was also declared a major factor in the successful construction of a project.

Standardization throughout the country of the forms to be used in obtaining data from the contractors regarding their equipment was recommended. It was further suggested that the AGC form already in use for this purpose be utilized by the sponsors for airport projects.

Many delays first encountered on the National Airport Program have been eliminated. The time between the advertising for bids and the notice for the contractor to proceed with actual construction has been shortened appreciably throughout the country, it was reported. However, even more time will be saved when the regional and district engineers of the CAA take maximum advantage of the authority they now have available.

Program Accelerates

Good progress is now being made in many areas in awarding airport projects. At the end of September 517 projects had been approved by the CAA involving about $56,000,000 of federal money and somewhat more of local and state funds. Of these jobs, 310 projects involving $33,000,000 of federal aid and above this in matching money were approved during the last six months. Moreover, 60% of all projects approved since May, 1947, when the first grant offers were made, have received clearance



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during the last six months.

Of the $106,000,000 in federal funds already provided for the construction program, which calls for $500,000,000 of federal aid over a period of seven years with somewhat more than this amount to be supplied by the sponsors nearly $100,000,000 has been programed. Projects calling for construction of all sizes of airports are now in progress, and as of September 21 a total of 244 projects with a total cost of about $60,000,000 were actually under construction. However, with the present rate of making federal appropriations, at the end of the 7-year period in which the program is scheduled to be carried out only 50% of the federal aid planned will have been provided.

Nineteen states as of July 31, 1948, had small unprogramed balances of federal aid available but the total of funds was less than $6,000,000. Those states with some funds unprogramed as of that date were: Connecticut, District of Columbia, Maine, Alabama, Florida, Mississippi, N. Carolina, S. Carolina, Kentucky, N. Dakota, Louisiana, New Mexico, Colorado, South Dakota, Wyoming, Nevada, Idaho, Montana and Oregon.

Engineering Costs Are Reasonable

Costs for surveys, engineering and detailed planning for projects already constructed were described as reasonable by CAA engineers. Detailed study of a limited number of jobs recently completed revealed that the engineering cost was 8.6% for a small project, 10.0% for medium-sized jobs, and 5.3% for the larger projects. The fact that the second figure is slightly higher than that for the smaller contracts is due in part to more engineering being required in securing adequate land and the fact some sponsors did some engineering work without federal aid.

Resolutions passed by the Joint Cooperative Committee included one that called for an amendment to the Federal Airport Act of 1946 to permit the CAA to advance 100% of the cost of surveys, plans and specifications for a proposed project to be carried out under that act, provided that the expenditure was considered part of the federal share of the allowable project cost when the job is actually constructed.

This resolution was aimed at assisting the sponsors of small projects to secure the necessary data required before a federal-aid allocation can be secured. It is to be noted, that when the project is actually carried out there would be no increased cost to the federal government over that under the present existing financing procedure.

A second resolution passed recommended that the federal government supply up to 75% of the cost of properly planned Class I airfields or the smaller airports in the CAA designation.

Hill Serves as Chairman

William C. Hill, chief engineer of the Oregon State Board of Aeronautics, served as chairman at the meeting.

The state aviation officials were also represented by Norman C. Bird, chief engineer of the Illinois Aeronautics Department; David Johnson, chief engineer of the Pennsylvania Commission; A. B. McMullen, NASAO's executive secretary and co-secretary of the Joint Cooperative Committee; Wayne A. Colby, chief engineer of the Michigan Commission; and Miss Madeline C. Dinu, legal counsel to NASAO.

Other state officials present were: George W. Pride, West Virginia airport engineer; Guy C. Richardson, chairman of the Iowa Aeronautics Commission; W. M. (Jack) Bartlett, Oregon aviation director; Col. Floyd Evans, chief of the National Guard division of the U. S. Air Force and formerly of the Michigan Commission; and the following men from the

(*Continued on page* 102)

ALLIS-CHALMERS SPECIFIES...
Velvetouch
ALL-METAL
STEERING CLUTCH FACINGS
ON THE NEW HD-19
Velvetouch cone clutch linings are also standard on Gar-Wood Models CU-1 and CU-2 cable control units.
Steering clutch disc for HD-19.
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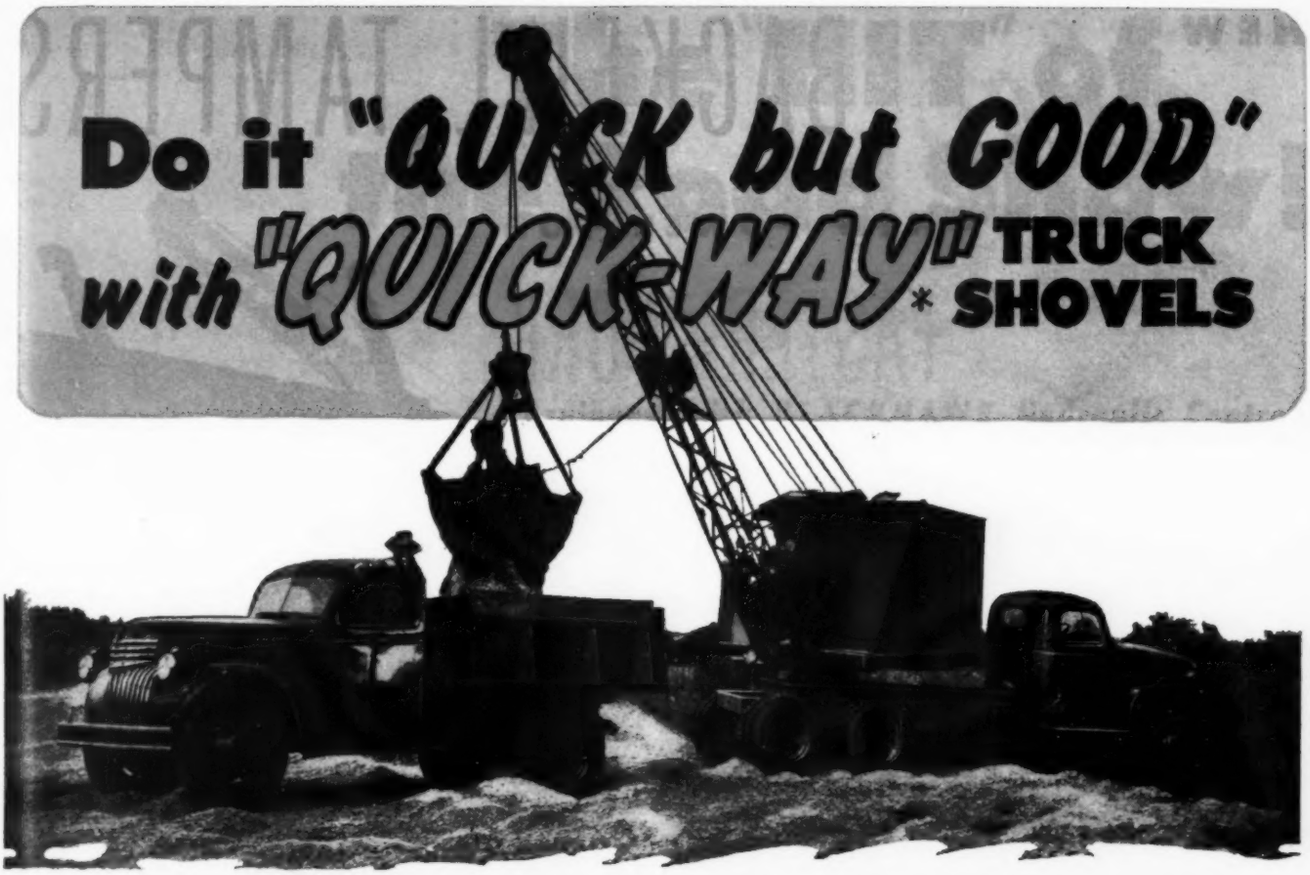
Like other leading manufacturers of heavy duty tractors and earthmoving equipment, Allis-Chalmers specifies Velvetouch for dependable power control. Because the powdered metals, used in making Velvetouch clutch facings and brake linings, are scientifically processed to minimize chattering and slipping . . . insure smooth, positive action. Genuine Velvetouch lasts longer, too . . . for it's all-metal . . . can't rot in oil or "burn" like conventional material. Send for descriptive literature today.
THE S. K. WELLMAN CO.
1374 East 51st St., Cleveland 3, Ohio
FOR BRAKE AND CLUTCH USE Velvetouch
WORLD'S LARGEST MANUFACTURERS OF ALL-METAL CLUTCH FACINGS AND BRAKE LININGS

Do it "QUICK but GOOD" with "QUICK-WAY"* TRUCK SHOVELS



Whatever the job, a *"QUICK-WAY"* will do it both QUICK and GOOD. What's more, a *"QUICK-WAY"* will move to the next job and be hard at work in record time.

"QUICK-WAY" Truck Shovels are built to travel with any of your other mobile equipment — anywhere a truck can go, at truck speed. Quality steel is used throughout to cut dead weight and improve strength and durability.

"QUICK-WAYS" are built low for stability on the job and on the road, clear low underpasses.

All parts are simple and easy to get at; this holds servicing time and expense at the minimum. Many working parts are interchangeable for easier, cheaper maintenance.

Best of all, a *"QUICK-WAY"* is many machines in one. Attachments are removed and replaced IN MINUTES to convert your *"QUICK-WAY"* from SHOVEL to CRANE, DRAGLINE, CLAMSHELL, PILE DRIVER, TRENCH-HOE, BACKFILLER or SCOOP. For speed, portability, economy of operation, and adaptability to a wider range of jobs, nothing of comparable size equals a *"QUICK-WAY"* Truck Shovel. There's a *"QUICK-WAY"* owner near you; ask HIM.

* Reg. U. S. Pat. Off.

"QUICK-WAY"

Model E. 4/10 cu yd. cap., mounts on standard. 5-ton truck.

Model J: 1/4 cu yd. cap., mounts on standard 1½-ton truck.

"QUICK-WAY" TRUCK SHOVEL CO.

DENVER, COLORADO

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Thor BACKFILL TAMPERS

NEW POWER FOR

FASTER WORK

NEW STREAMLINED DESIGN

EASIER HANDLING

Just open the valve . . . the new Thor Backfill Tamper will pound more dirt into the hole than you can shovel out of it!

Even the stiffest backfill is pounded solid—*quickly*, with the rapid, powerful blow of this new Thor . . . with a minimum of lifting by the operator. New plate valve and enlarged air ports deliver maximum power under varying air line pressure. Automatic lubrication. Positive-lock butt. Positive air seal.

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For top efficiency, always specify Thor hose, couplings and clamps.

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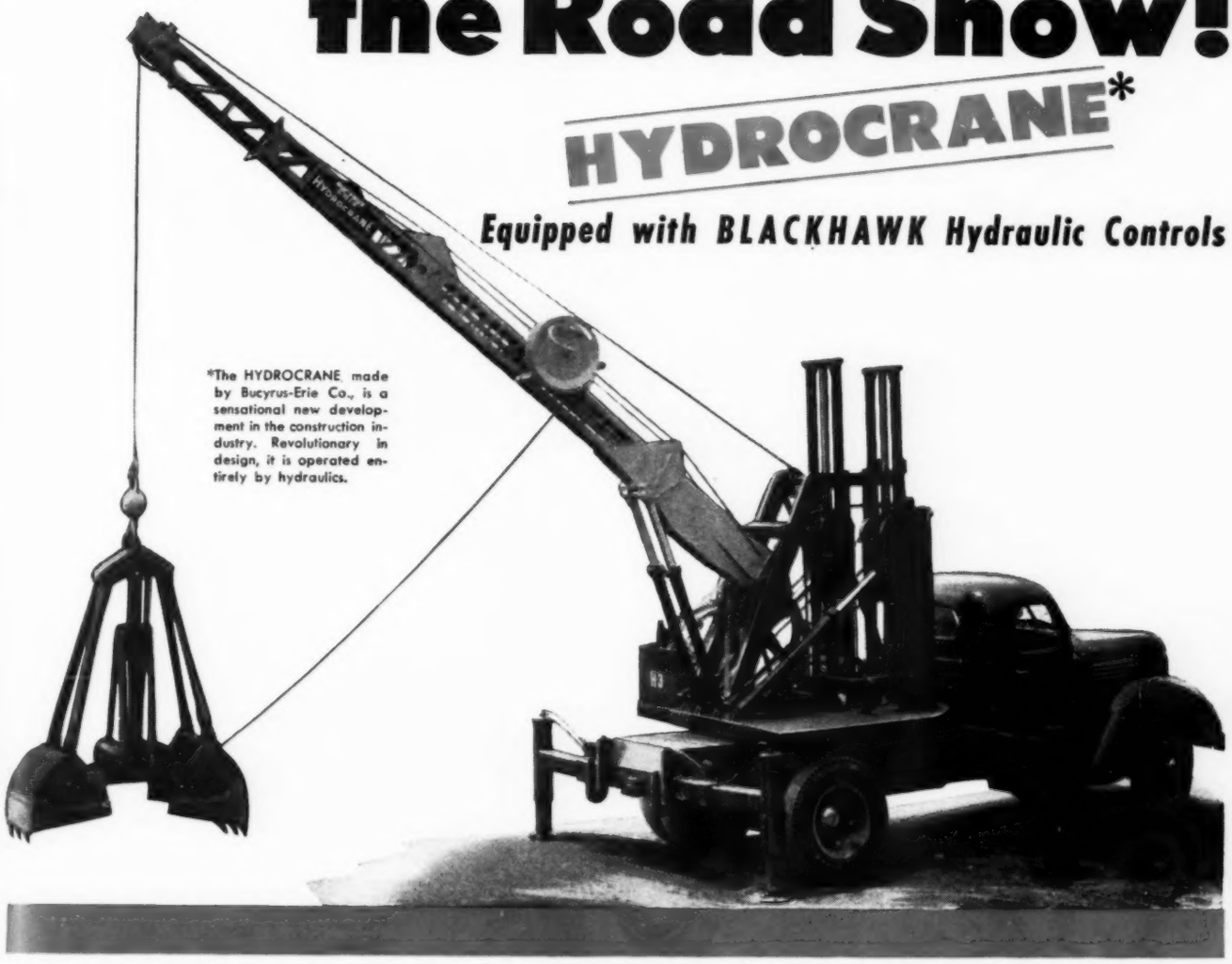
PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

The "HIT" of the Road Show!

HYDROCRANE*

Equipped with BLACKHAWK Hydraulic Controls



*The HYDROCRANE made by Bucyrus-Erie Co., is a sensational new development in the construction industry. Revolutionary in design, it is operated entirely by hydraulics.

Compact, double-acting control valves permit fingertip control of rams at all times.

Blackhawk builds both power-driven and hand-operated high - pressure pumps.

Blackhawk's complete range of standard rams assures the *right* size for every application.

"Don't miss Hydrocrane" was stock advice at this year's Road Show. Yes, the crowds that packed the Hydrocrane exhibit saw something radically new in construction equipment. Completely controlled by Blackhawk hydraulics, the new Hydrocrane featured many outstanding advantages. Gears, shafts, clutches, drums, brakes, etc., or a total of over 5000 parts, are eliminated. This amazing reduction insures longer product life, less maintenance. Hydrocrane is small and compact, rugged and safe. Every pound is live weight. All "dead" counterweights are eliminated. These and many others are typical of the advantages that Blackhawk Hydraulic Controls create on the equipment of other manufacturers.

TO EQUIPMENT MANUFACTURERS. Blackhawk Hydraulic Controls are engineered and priced for quantity purchases and installation on your products. Submit your hydraulic problems to us; we will work with you in confidence.

For complete details on Blackhawk Hydraulic Controls, refer to Sweet's Catalog Service, Product Designers Section, Bulletin $\frac{19}{1A}$ *or write direct.*

BLACKHAWK MFG. COMPANY • Dept. PE108 • Milwaukee 1, Wisconsin

BLACKHAWK

High-Pressure Hydraulics

HAND JACKS • SERVICE JACKS • WRENCHES • PORTO POWER • RECK-RACK

Pick Any Job

- Grading Banks
- Building Ditches
- Scarifying
- Mixing Black-Top
- Snowplowing
- Removing Sod

. . . THEN CAN

Takes Maintenance Work in Stride — cuts smoothly, to fractional inch accuracy . . . blade held firmly on work through direct down pressure. Highly maneuverable — ideal for operation in close going and on narrow roads and streets.

Easily Grades Banks — tears into heavy bank work . . . hugs slopes as it smooths — it is strong, stable, powerful, properly balanced.

Builds Ditches Quickly — leaning front wheels are set firmly against load . . . extra stability and flotation obtained with oversize front tires. No protruding hub caps to break off or hang up grader.

Scarifies, Mixes Black-top — you'll be surprised at the power and stability of the BD on this work . . . tears up tough material, turns over heavy windrows.

NEW BD HANDLE 'EM ALL

The BD brings you big grader performance at medium grader economy! A 17,772 lb. machine with a 50.5 brake hp. diesel engine, it does a remarkable job on every job — pushes more dirt than you would ever believe possible. Easily handles high, heavy bank cuts or tough ditch work . . . it's a *motor grader* — through and through!

There's no *one* reason for its unusual earth-moving capacity and versatility . . . it's a combination of *all* features —

. . . the *right balance* between weight, speed and horsepower for greater stability, more traction and fast, accurate cutting.

. . . a "*roll-away*" *moldboard* that rolls instead of pushes material, requiring less power.

. . . *high clearance* at throat as well as axle that increases volume of material handled.

. . . tandem drive, direct down pressure of blade, full circle revolving blade, a full range of blade positions

. . . General Motors 2-Cycle Diesel Power, leaning front wheels, easier steering and convenient controls, full blade visibility — these and many other advantages all contribute to its outstanding performance.

Whatever the type of job . . . the BD Motor Grader can do it . . . at big savings to you. "Seeing Is Believing." Watch it perform at your first opportunity.

FULLY EQUIPPED, including electric starter and lights. Available with scarifier, cab and snowplow. Choice of standard or oversize front tires (9:00 or 12:00).

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TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

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TONCAN* Iron Corrugated Metal Pipe Is Strong . . . Flexible, Too!

1. **HIGH STRENGTH** enables it to carry tremendous loads.
2. **RESILIENCY** prevents cracking or crumbling in handling, or in service—protects against vibration, impact, severe weather changes, and uneven settlement of fill.
3. **LIGHT WEIGHT** makes handling and installation easy for unskilled labor. It stays in line—will not come apart at joints.
4. **RUST RESISTANCE** of an *ALLOY IRON,* containing *twice* the copper found in copper-bearing steels and irons *PLUS* molybdenum, assures long life at lowest cost per year of service.
5. **100% SALVAGE VALUE** permits re-use without loss.

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These members of the Toncan Culvert Manufacturers' Association are ready to help you

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Toncan Iron — A Product of Republic Steel Corporation — is available in:

CORRUGATED METAL PIPE • PERFORATED CORRUGATED METAL PIPE • CORRUGATED METAL PIPE-ARCH • CORWEL SUBDRAINAGE PIPE
SECTIONAL PLATE PIPE • SECTIONAL PLATE ARCHES • SECTIONAL PLATE PIPE-ARCH • BITUMINOUS COATED AND PAVED PIPE

A BOTTOM-DUMP EUCLID

13 cu. yds. struck

with all the job-proved features of Bottom-Dump "EUCS"

***plus* AIR BOOSTER STEERING!** ***plus* NEW IMPROVED SEAT!**

***plus* LARGER TIRES!** ***plus* NEW HOPPER DESIGN!**

These new Euclid features provide better traction and flotation, easier handling, more driver comfort and quicker shedding of sticky materials.

AIR BOOSTER STEERING—Euclid air booster steer reduces driver effort on turns and tough hauls . . . retains feel of the road . . . gives better control on soft fills.

NEW IMPROVED SEAT—A form fitting bucket type driver's seat has compression spring and rebound hydraulic shock absorber . . . built for long life in heavy service . . . provides a comfortable ride even on the roughest hauls. Adjustable for driver's weight and position.

LARGER TIRES—Better traction and flotation are obtained with 24.00 x 25 low pressure tires. Tapered bead seat on tire rim provides better gripping action between tire and rim.

NEW HOPPER DESIGN—Steeper hopper sides assure clean, fast shedding of sticky materials. Improved design of the wedge shaped hopper places more payload weight on drive tires for better traction.

See or write your Euclid distributor for complete information on this new Model FDT-89W Bottom-Dump EUCLID.

The EUCLID ROAD MACHINERY Co., Cleveland 17, Ohio

EUCLIDS

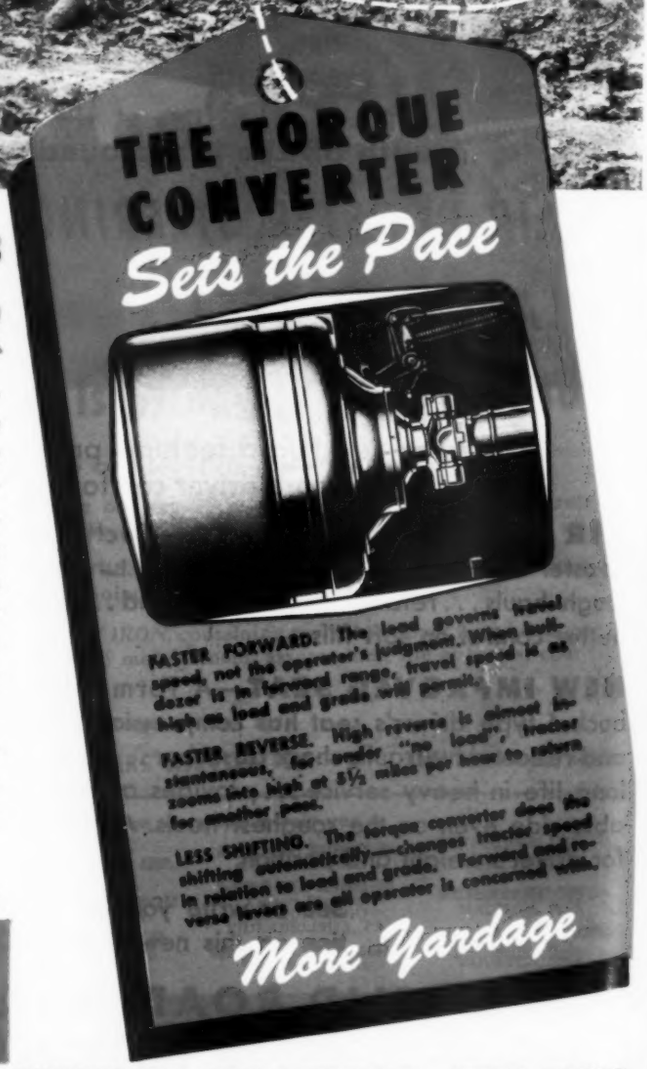
POWERFUL Workhorse-

THE TOUGHER THE JOB THE MORE YOU NEED A BAKER

Here's a rugged "he-man" outfit that can take a real beating and "dish it out" in return. The sensational performance of the giant Allis-Chalmers HD-19 teamed up with the Baker Hydraulic Bulldozer has rocked the entire earthmoving industry — set a new high in production — a new low in cost. Compare the Baker with any bulldozer on the market — you get direct lift; direct down pressure; engine mounting, 5-position adjustable blade tilt; interchangeable bulldozer or grade-builder blades; blade pitch adjustment; smooth, fast, dependable hydraulic control, plus extra rugged construction which has made Baker famous throughout the world.

Mounted on an HD-19 you've got an unbeatable bulldozing team — speed, power, traction and over 48,000 lbs. of fighting weight. Your best bet is Baker. See your Allis-Chalmers Baker dealer now.

BAKER MFG. CO., SPRINGFIELD, ILL.


THE TORQUE CONVERTER
Sets the Pace
FASTER FORWARD. The load governs travel speed, not the operator's judgment. When bulldozer is in forward range, travel speed is as high as load and grade will permit.
FASTER REVERSE. High reverse is almost instantaneous, for under "no load", tractor zooms into high at 5½ miles per hour to return for another pass.
LESS SHIFTING. The torque converter does the shifting automatically—changes tractor speed in relation to load and grade. Forward and reverse levers are all operator is concerned with.
More Yardage

They Go Together! BAKER AC

BAKER

BULLDOZERS • GRADE BUILDERS • SNOW-PLOWS

$7,000,000 Snow Fleet

Keeps Pennsylvania's State Roads Open

Summary of our biggest state-directed snow and ice program, involving over 2000 trucks at times

By Warren K. Myers

Chief Maintenance Engineer, Pennsylvania Department of Highways, Harrisburg.

AT one time a state highway system consisted of a number of independent state highway routes. In the State of Pennsylvania the original state highway system consisted of roads connecting county seats. State highway systems have now become an integrated transportation system. As such, it is imperative that this system be available for traffic at all times. With the migration of city dwellers to the interurban and rural areas, the consolidation of rural schools, the centralization of milk handling stations, the extension of mail routes, etc., the requirement that roads be available for use at all times is greater than ever. This has increased the responsibility of those in charge of the maintenance of highways.

One of the most important items of highway maintenance is snow removal and ice control. This is the principal occupation of maintenance forces between December 1 and March 31.

The maintenance personnel of the Pennsylvania department of highways consists of the headquarters personnel, including the secretary of highways, chief engineer and chief maintenance engineer. The State is divided into eleven engineering districts, each in charge of a district engineer, assisted by a district maintenance engineer directly responsible for the snow removal in the counties within the district. Each county is under the supervision of a county superintendent who has several assistants, together with foremen, mechanics, equipment operators, caretakers and laborers who handle the actual snow removal work.

26,000,000 Ft. of Fence

Our snow removal season starts with the erection of snow fence immediately after November 1. The state law permits the department of highways to erect and maintain snow fence on private property between November 1 and March 31. Twenty-six million feet of snow fence is erected and removed annually. This is placed at locations where drifting is liable to occur along the entire 40,893 miles of our state system. During the summer months cinders are stored. Additional cinders to replenish the piles are obtained as required during the winter months. Approximately 400,000 tons of cinders are required annually.

Just as soon as equipment can be released from construction work our trucks and tractors are placed in our garages to be thoroughly checked and

★ More horsepower and speed is the trend in keeping large mileages of arterials open

★ Redrifting keeps the crews busy

Pennsylvania Buys New Fence and Plows

The Pennsylvania Department of Highways took bids this past summer for two million feet of new snow fence. This is in addition to a purchase made last year, which was the first since before the war. The 1948 purchase, as well as last year's, will be for replacement purposes, since the department hopes to maintain about 13 million feet of fence stocked for placing at drip spots along the roads.

In addition, the department, during the past summer, took steps to acquire about 200 new trucks and 300 new snow plows, also for replacement purposes. The trucks do double duty for maintenance in spring and summer.

overhauled, if necessary, so that they are ready for plowing snow. About December 1 snow plow attachments are installed on trucks so that snow plows may be attached quickly in case of a storm. After each storm, trucks and tractors are checked and necessary repairs are made.

County is Spearhead

Snow removal activities are controlled from the maintenance building in each county. When a storm starts, the watchman calls the superintendent, who assumes the responsibility for calling other personnel and supervises the dispatching of equipment. Each truck is given a specific assignment, which covers from ten to fifteen miles of main state highways and approximately the same mileage of secondary roads. When the operator has completed his assignment he reports to the garage for further instructions. During a storm we use approximately 1,000 department-owned trucks, equipped with plows, and 500 rented trucks with plows. In case of an ice storm approximately 500 trucks are used to spread cinders. During the past winter we used a considerable number of powered mechanical cinder spreaders. These gave excellent results where screened cinders were available. In addition to heavy truck equipment, 1,200 wagonettes are used for cindering work.

During the past season chlorides were used in connection with ice control. Calcium Chloride ($CaCl_2$) was mixed with cinders at a rate of about 75 lb. per cu. yd. of abrasive. The available supply of calcium chloride limited the use of this material to a great extent. In the Pittsburgh and Philadelphia areas we used sodium chloride (NaCl) in an effort to establish bare pavement maintenance. After the snow had been removed, about 400 lb. of sodium chloride per mile of two-lane pavement was applied to the roadway surface. This removed any ice film that might have formed after the snow plows had completed their work. Chlorides were used only on bituminous pavements and concrete pavements more than five years old.

I previously stated that snow removal is one of the principal items of maintenance with the Pennsylvania Department of Highways. Last year (1947) our maintenance costs were divided as follows:

Gen. Maintenance, Roads and Bridges	$14,840,466
Surface Treatment	3,704,100
Snow Removal	7,262,267

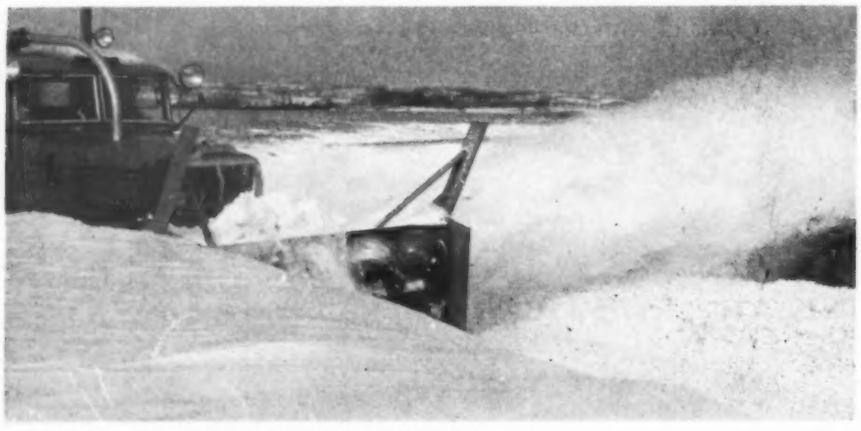
Some 20,398 miles of the 40,893-mile state system are scheduled for complete snow removal service. Snow removal and cindering are undertaken on the programmed roads first. After work is completed on these roads the equipment is assigned to improved secondary roads—approximately 16,000 miles. Snow removal on the remaining 4,500 miles of unimproved road is undertaken only when the roads become blocked to traffic.

$7,000,000 Fleet

Our equipment consists of 1,362 department owned trucks equipped with snow plows, 161 power graders and 70 tractors equipped with "V"-type snow plows or bulldozers. This equipment is valued at approximately seven million dollars. Our own fleet is augmented by rented equipment as required.

During the year the department experimented with the use of radio in connection with snow removal. Radio equipment was used in two of the larger counties in which a considerable amount of snow is involved. The radio equipment permitted us to dispatch trucks and keep in contact with them during the period of operation and permitted the assignment of equipment without waiting for telephone calls or returning to the garage for instructions. There are many sections in Pennsylvania where wired communication services are not available, and radio equipment permitted us to handle operations in those areas with the minimum loss in time.

The average cost per mile for removing snow on main highways in Penn-



★ Rotaries are kept available at strategic locations

sylvania was approximately $360; the average cost for removing snow on secondary roads was approximately $100. These figures can be compared with a total cost of $590 per mile for all other maintenance work on main state highways and $356 per mile for all other maintenance work on secondary roads. While the cost for snow removal is comparatively high, the public is demanding it and they are willing to pay for it in the form of gasoline tax.

While the demands made by the public were much greater than in any previous year, the complaints were considerably fewer. Most of the complaints originated on sections of unimproved road where storms closed the roads for several days at a time and the severity of the storm did not permit withdrawing equipment from main highways to open these roads.

The present snow removal service in Pennsylvania, with an expenditure of seven and a quarter million dollars per year, covering 41,000 miles of highway, represents a considerable contrast with snow removal work in 1923, when snow removal service was provided on approximately 1,400 miles of road and the total expenditure was $91,116.

Snow Plowing Cooperatives

Successful in this North Dakota County

AROUND Hoople, North Dakota, many miles of rural roads are kept open in winter by a cooperative effort. The idea has quite a history locally. The first rural snow plow association was formed in Glenwood county a number of years ago. Its purpose was to speed the work of plowing town and county roads, and to plow the immense drifts that formed to block farm lanes and farmer's yards.

The farmers organized a cooperative organization for the purpose of clearing the snow-choked roads in the shortest possible time. Originally set up with 50 members and a second-hand 2-ton truck, the organization proved its worth in a short time and a second group was organized in the eastern half of the township.

The first cooperative, dating back to 1940, called itself the Glenwood Township Snowplow Association. More enthusiastic today than ever over their organization, they recently purchased a new modern truck (a model HA FWD) to do their snow plowing work.

The second group organized in August, 1946, purchased a single heavy truck plow outfit as its initial investment. Known as the Hoople Community Snow Plow Association, it has over 100 members.

Both truck are equipped with V-type plows. They plow the county and township roads along which association members live and also clear the lanes leading into the farms themselves. The trucks are kept at the farms of their operators. Three brothers, Norman, Harold and George Bjorneby, change off driving the Glenwood unit, which is kept at the Bjorneby farm. This truck covers the western half of the township.

The Hoople community's truck is stationed at the farm of Oliver Olson, about 20 miles southeast of Hoople. It covers about 50 miles of road.

Many Benefits

As a member of one of these organizations a farmer gets the road past his farm plowed out. And, what is usually more important, he has his private lane and farmyard cleared of snow. This is no small service, as North Dakota snow conditions usually mean large drifts in the immediate vicinity of any buildings.

During the summer months the trucks are used by the various members on a rental or call basis. All types of towing and moving jobs are then given to these trucks. During the summer of 1946 the Glenwood Township Snowplow Association's FWD was fitted with a large watertank and made the rounds daily distributing drinking water to the members. The water was hauled from a neighboring community.

But the principal purpose behind the organization of the associations is to get produce to market during the winter months. During previous winters the farmers missed out on good prices because of snow blocked roads which were sometimes blocked for so much as two weeks at a stretch.

Motor Vehicle Registration Increases

Motor vehicle registrations in the United States this year will exceed 41,000,000, topping all previous records, according to preliminary reports received by the Public Roads Administration of the Federal Works Agency from state authorities. On the basis of current totals, an estimated 40,557,000 privately-owned automobiles and commercial vehicles, including buses, will be registered during the year, an increase of approximately 3,200,000 or 8.6% above the 37,360,463 private and commercial vehicles registered last year. Registration of public vehicles owned by federal, state, county and municipal governments, estimated at 500,000, will bring the total registration for the year to more than 41,000,000.

★ One of the cooperatively owned trucks being used by farmer groups in North Dakota to supplement state and county road plowing

Placing Sod by Conveyor

Belt unit saves work of five men on Michigan road job

SOD is awkward, heavy stuff, and handling it eats up man-hours. In this day of million-dollar grading and paving outfits it is still a common sight to see sweating laborers handling and placing sod manually and watering it down with the sweat of their brows, so to speak. Sod cutters have come into use, but little other mechanical handling equipment.

All this wind-up is by way of reporting that a Michigan road contracting firm, Graham & Metcalfe, of Bennington in that state, have put a lowly belt conveyor to work to good advantage in sodding of large cut and fill slopes. Sod was placed at a rate of 2,000 square yards per day, with a 5-man crew including the truck driver, in finishing up a section of the new US-12 by-pass around Jackson, Mich. This use is said to be a "first" in Michigan road circles. The firm acted as a sub-contractor here for F. G. Cheney Co. of Lansing.

The sodding job, totaling 63,000 sq. yd., was required to be completed by July 1 because of moisture conditions usually prevailing. In order to do the work of placement fast enough to get done under the time limit, and save labor, the contractor partners set about early this year devising the special equipment. The rig is simple, at that, consisting merely of a 40-ft. endless-belt conveyor, supported at one end by a light, four-wheeled unit and powered by a small, air-cooled gasoline motor. A V-belt drive connects the flywheel with the belt shaft. The belt can be laid up the side of a deep cut, or angled down over cut slopes, as required; or, of course, used on a level where lateral transportation of truck-delivered sod is required.

★ Looking along a deep cut on US-12 Jackson bypass. Immediate sodding here was considered an economy because of the sandy, easily eroded soil

Major Duane Metcalfe of the firm, who recently came out of the Army after seven years' service, is credited with devising the conveyor.

★ Up goes the sod, as fast as one man can shovel it from the truck bed to the belt. Dr. Walter Graham, member of the contracting firm of Graham & Metcalfe, is seen facing the camera

Equipment Distributors Meet in January

More than 1,200 distributor and manufacturer members of Associated Equipment Distributors throughout the United States and Canada are expected to convene at the Stevens Hotel in Chicago, Jan. 16-20, for the association's 1949 annual meeting.

The A.E.D. convention program committee, headed by Chairman E. H. Kliebenstein of E. H. Kliebenstein Company, Ridgefield, New Jersey, meets in Chicago Nov. 18 to discuss arrangements. Other members are H. J. Hush of Griffin Equipment Corporation, New York, New York; P. L. Patterson of Patterson Equipment Company, Cleveland; P. W. Burke of Allied Equipment Company, Miami, Florida; and John Carroll of Harron, Richard and McCone Company of Southern California, Los Angeles.

All registration requests or inquiries should be addressed to Frank G. Knight, Executive Secretary, Associated Equipment Distributors, 360 North Michigan Avenue, Chicago 1, Illinois.

Road Need Reports Submitted In Oregon and Washington

Huge sums needed in both states for road modernization, along with reclassification of many roads and streets. New administrative set-up recommended in Washington

ENGINEERING reports with proposals for long-range highway programs have been submitted to Highway Study Committees in Washington and Oregon. According to a bulletin from the National Highway Users Conference, the reports, among other things:

(a) Analyzes highway deficiencies through the application of "tolerable" standards of highway improvement;

(b) Evaluates the cost of long-range programs;

(c) Discusses desirable highway policies, including scientific classification of roads according to systems, maintenance practices, improved highway operation through highway engineering techniques, and coordinated and efficient highway administration;

(d) Calls attention to needed solutions of the parking problem;

(e) Recommends a comprehensive traffic safety program based on the Action Program of the President's Highway Safety Conference;

(f) Urges adoption of uniform motor vehicle laws;

(g) Recommends that legal limits on sizes and weights of vehicles should not exceed "recognized national standards."

Financial reports in the two states have not yet been completed. The Oregon report is being prepared by the Highway Interim Committee itself, while the Washington report is being conducted by Dr. James C. Nelson, Professor of Economics of Washington State College. In both states highway user organizations have appeared before meetings of the committees and actively advanced their suggestions for highway improvement.

Specific findings in the two states are as follows:

Washington's 10-Year Needs

The report entitled "Highways in Washington's Future," finds that 52% of the state's roads and streets—27,378 of the 52,456 miles—require improvements. One third of the deficiencies should be corrected at once. Nearly 3,000 bridges and structures are deficient. The report finds that 86% of the primary state highway mileage and 90% of the secondary is deficient.

Deficiencies are most urgent on the roads and streets which carry the greater part of the traffic. The greatest needs are for improved surfaces and properly designed thoroughfares to increase traffic capacity. The cost of constructing facilities needed on all roads and street systems for the next ten years totals $868,611,000.

The report submits annual estimates for 10, 15 and 20 year programs but recommends the 15 year program as the best. *Estimates of annual cost* for these periods, broken down according to road systems, are as follows:

	1946* Actual Expenditures	10 Year Program	15 Year Program	20 Year Program
State highways (including urban extensions)	$18,653,269	$56,595,000	$46,624,000	$36,068,000
County Roads	$18,228,880	$26,504,000	$21,904,000	$19,889,000
City Streets	$12,822,695	$13,679,000	$11,832,000	$11,171,000
Total	$49,704,844	$96,778,000	$76,360,000	$67,128,000

*Latest figures given in the report. Figures are exclusive of collection expenses, highway safety and parks.

In calling for a better system classification of state highways, county roads and city streets, the report recommends that responsibility for state highway routes within city limits should be transferred from municipal governments to the State Department of Highways, and that certain roads in the Columbia Basin be added to state and county systems. It also recommends that 25% of the county roads should be designated as the County primary system and 20% of city streets should be designated as the arterial street system. The limited access highway law, at present applicable only to new construction, should be broadened to apply to existing highways.

With respect to the management of the highway program, the report states that no existing form of highway organization fully meets modern requirements for complete integration of all elements of the transportation system, but working relationships developed between the Federal government and the state constitute a desirable pattern to be followed. In Washington a new administrative unit is needed to coordinate the administration of county and city highway affairs, insofar as state interest is concerned. The unit system of road administration should be established in all Washington counties. Street activities of all municipal departments should be closely coordinated under one responsible city official. Steps should be taken to attract needed engineering personnel into the highway field in this state.

Oregon: $700,000,000 Job

The report entitled "Highway Transportation in Oregon, Present and Future Needs," states that as a result of the engineering analysis, 21,654 miles or 54.8% of Oregon's roads and streets were found to be below "tolerable" standards, either structurally or functionally, or would become so before the end of the ten year period. 7,210 miles, or 18% of all mileage, are in immediate need of reconstruction.

Broken down by systems, 21% of the state primary, 13% of the state secondary, 50% of 4,300 miles of main county roads, and 42% of city arterial streets are in immediate need of improvement.

In addition, the number of structures (stream crossings and grade separations) requiring rebuilding, or replacement on new locations, totals 763.

The need for improvements on the state system of highways is shown by the fact that while such roads comprise 17% of the total mileage of Oregon, they carry 66% of all traffic. Insufficient width (surface and roadway), substandard surface conditions, and poor drainage constitute the major deficiencies.

The cost for construction of facilities needed on all roads and street systems for the next ten years totals $704,983,000, of which $261,327,000, or 37% represents immediately needed construction. The report submits annual estimates for ten, fifteen, and

Oregon	10 Year Program	15 Year Program	20 Year Program
State Highways (including urban extensions)	$53,197,000	$39,074,000	$32,907,000
County Roads	$20,527,000	$16,398,000	$14,666,000
City Streets	$ 9,694,000	$ 7,814,000	$ 7,036,000
Total	$83,418,000	$63,286,000	$54,609,000

(*Continued on page* 90)

Closing the Gap Between Research and Practice

By C. A. Hogentogler, C.E.

The following comment on Mr. Hogentogler's September article was received from Troy Carmichael, Member, American Society of Civil Engineers, representative of the New Jersey Bituminous Concrete Association, Trenton, N.J.

Pavement Design Formulae

In an article entitled "More About Mathematical Theory and Research Data" in ROADS AND STREETS, September, 1948, C. A. Hogentogler, C. E., presents a very interesting and illuminating discussion of the PRACTICAL value of complicated mathematical formulas for determining the thickness of pavements required for various wheel loads. He begins by stating A. T. Goldbeck's 1919 formula $d = \sqrt{\frac{3W}{S}}$ in which:

d = thickness of pavement slab in inches.

W = wheel load, in pounds, applied at the extreme corner of the slab.

S = modulus of rupture of the concrete in pounds per square inch.

Five years later Clifford S. (for shame joint) — you know what I mean: he designed a center joint because he was ashamed of the irregular crack)—Older, in reporting on the results of the Bates road test, stated that it "may be used with considerable confidence." Personally, I have never had much CONFIDENCE in the formula since H. F. Clemmer wrote in the same year, "The prime development from highway research in Illinois has proven practical for use in the formula, $d = \sqrt{\frac{3W}{S}}$. Concrete roads designed under this formula and on which traffic loads are properly controlled, will last indefinitely." Without specifying whether the minima or maxima values of "indefinitely" should be used, Clemmer's opinions are valueless in arriving at an "expected life" figure, the "hallmark" of pavement design.

Mr. Hogentogler, after listing many variables which affect the results obtained by use of the formula, states:

"Later, another assumption entered the picture. This one deals with the length of slabs and is given by Dr. Westergaard in *Public Roads*, June, 1929, as follows:

" 'When cracks form in a concrete pavement, larger slabs of the pavement are divided into smaller ones.' "

Since Adam's original ejaculatory statement—"I've been ribbed"—I consider the Doctor's ASSUMPTION the closest approach to absolute truth of any sentence written in the interim. Of course, I had discovered the same thing myself at a very early age by breaking crackers into my soup. That was before Emily Post's ever-changing social formulae hit our dining room. Technically, however, I cannot and will not claim discovery of the Doctor's ASSUMPTION because I did not record my findings. I was five years old.

Mr. Hogentogler further states that, in arriving at correct dimensions for the thickness of airport runways using this formula, the Public Roads Administration used the following assumptions in arriving at 6, 8, 10 and 12-inch slab thicknesses for various wheel loads:

1. "The subgrade is of excellent quality such as would be furnished by soils of the A-1, A-2 or A-3 groups, or by a foundation course of these materials from 12 to 18 inches thick placed on soils of A-4, A-5, A-6 or A-7 groups.

"In addition, subgrade soil must be:

2. "Homogeneous
3. "Perfectly elastic
4. "Isotropic

"The subgrade must:

5. "Provide perfectly uniform support at all locations beneath the slab.
6. "Be everywhere in contact with the slab. Like the subgrade soil, the concrete comprising the slab must also be
7. "Homogeneous and elastically isotropic.
8. "Slab length must be 15′ only.
9. "The slabs will be uniform in thickness.
10. "The total stress in the slab is approximately 500 lb. per sq. in., 150 lb. per sq. in. of which is produced by restraint temperature warping; thus leaving 350 lb. per sq. in. to be produced by wheel loads.
11. "Wheels loads must be static only."

Therefore, in designing a new airport in an area where the assumed ideal conditions were non-existent, the formula becomes:

$d = a\ b\ c\ e\ f\ g\ h\ 15'\ j\ k\ m \sqrt{\frac{3W}{S}}$

where a, b, c, e, f, g, h, j, k and m are correction coefficients necessary to arrive at SCIENTIFIC RESULTS in spite of unfavorable conditions numbered 1 to 7 and 9 to 11, inclusive.

The formula then loses all Goldbeck characteristics and becomes strictly Goldberg (Rube).

Now that I have clarified for all time the practical application of the Goldbeck formula—check me if I am wrong, Mr. Hogentogler—let us take up the formula for the thickness of BITUMINOUS CONCRETE PAVEMENT. In Mr. Hogentogler's closing paragraph he states:

"Finally, in order to prevent any misunderstandings, it should be emphasized that the CALIFORNIA BEARING RATIO method of design is not now, and never has been, a mathematical theory. After devising this bearing ratio test, O. J. Porter first (afterward the U. S. Army) and various state highway departments, etc., correlated its results with the performance of roads and, in this manner determined the required thickness of flexible pavements on the basis of experience or principles of common sense."

Well! Now we are getting somewhere. In changing the discussion from rigid to flexible pavements, via California Ratio Test, a new variable, COMMON SENSE is thrust into the subject of Pavement Design. This was one of the prominent features in

the design and construction of flexible pavements for a half century before the above test was conceived. It was most noticeable by its absence in the application of the Goldbeck formula by many of his following disciples in the design of rigid pavements.

With this new variable, a formula for the design of pavements immediately becomes of great value.

The following formula, which I confidently expect will be henceforth known as the CARMICHAEL FORMULA, will give accurate values for d to plus or minus ⅛ plus or minus inches and will result in pavements which will serve traffic without ALIHIS for more than twice as long, based on Illinois' rigid slab experience, as Clemmer's "INDEFINITELY":

d=5W x .00000A plus CS.

where

d=thickness in inches

5=age of the designer when he first discovered, via the cracker-soup route, that when an object is broken, no part is greater than the whole.

(To avoid undue complication, I think it is safe to assume that any child of 5 years of age knows that much, so 5 becomes a constant. Note that Goldbeck furnished no such logical explanation of his 3.)

w=wheel load

A=designer's age. (I put those five ciphers in front to make it look as highbrow as the Goldbeck formula.)

CS=Common Sense, not Cement, Sacked.

Instead of the P.R.A. eleven assumptions, use is made of only

1. The base course shall be constructed of graded compacted stone with 15% or less passing the ¼" mesh screen, varying in depth to the nearest ½" upward, between 4" and 11" in proportion to the volume of traffic in numbers.

The depth of the stone base is the result of experienced Common Sense such as:

Two inches of BITUMINOUS CONCRETE PAVEMENT on a 4" stone base has proven serviceable to the extreme for small traffic volumes throughout the United States. In many cases where the compacted subgrade had a hardness coefficient of H (H=Hell), this light design has carried unlimited traffic for a quarter of a century or more without maintenance. Three inches of BITUMINOUS CONCRETE PAVEMENT on eleven inches of stone base laid on a very unsatisfactory subgrade, so unsatisfactory as a matter of fact that the completed structure was termed "temporary," served for sixteen years as a satisfactory pavement for traffic reaching 100,000 vehicles per day on U. S. Route 1 between Elizabeth, New Jersey, and the Pulaski Skyway in Newark. Of course, if the designer had realized at the time that the pavement would last sixteen years, he would have made it thicker. Why? God only knows. Maintenance was required to offset settlement of the subgrade only. The 3" BITUMINOUS CONCRETE PAVEMENT remained unfractured. Adjacent pavements, designed according to the Goldbeck formula, carrying the same traffic but on the GOOD portion of the subgrade, were extensively ruptured in odd patterns long before they reached Mr. Clemmer's "indefinite" age.

Now let's see how the formula works:

Professor Worley of the Michigan University Engineering School recently reported to the Pacific Logging Congress that 2 to 3 inches of BITUMINOUS CONCRETE PAVEMENT on river gravel base carrying logging trucks, some of which had a gross load of 200 tons, showed no signs of failure after 6 or 7 years' use. Fifty percent of this load, due to overhang, was carried on the four wheels of the dual rear axles.

The formula then becomes:

d=5W × .0000058 plus CS = 1.45" plus CS.

My common sense, based on 38 years' experience, tells me that the result is about 1" too small, so the final result is 2.45", which is close enough to check the mean of the professor's SATISFACTORY 2 to 3-inch thickness.

But supposing a young engineer—say 25 years old—without my common sense, were designing a pavement to carry the same load.

The formula then becomes:

d=5W × .0000025 plus CS or

d=0.625 plus CS

No young engineer would possess experience and common sense to equal that of an older man, so he would need more CS. Consequently, d = 0.625 plus 2"=2.625". You will no doubt notice, as expected, that he does not check the Professor's findings as accurately as a more experienced engineer, but he is on the safe side. Let me also point out that a designer 60 years of age, an age when his Common Sense should reach its peak, checks the mean of the "2 to 3 inches" exactly, which is what you would expect of a GOOD formula in the hands of an engineering sage. (The Asphalt Institute, 801 Second Ave., New York, will prove of invaluable assistance to inexperienced engineers in arriving at safe values for CS.)

I challenge the Public Roads Administration to do as well with the Goldbeck formula preceded by their 10 assumptions and 15 feet.

It should be noted that in choosing volume of traffic instead of weight as the predominant component of base design dimensions, it was felt that as long as a truck carrying 200,000 lbs. on the four rear wheels was running loose around the country, it must be provided for in the BITUMINOUS PAVEMENT design to avoid some engineer from using it later as an alibi as Mr. Clemmer evidently contemplated when he inserted the words "on which traffic loads are properly controlled" in his 1924 prophecy.

Since Mr. Hogentogler limited the use of "Common Sense" to BITUMINOUS PAVEMENT DESIGN, I feel that it is without the scope of a reply to his studied article to inject the subject of an application of the CARMICHAEL FORMULA to pavements rigid in character.

California Gasoline Tax Brings in $116,977,647

Sacramento, Calif.—Registering the largest dollar increase of any state revenue source, California's gasoline tax yielded $116,977,647 in the fiscal year ended June 30, 1948, a gain of 59½% over the preceding fiscal year, it was announced by State Controller Thomas H. Kuchel.

The sharp gain was attributed largely to the increase in the gasoline tax rate from 3 to 4½ cents per gallon last year.—**Transport Topics.**

Missouri's income (after payment of refunds) from the present 2 cents per gallon gasoline tax for the same period of time was $16,576,109.

Clearing House Section 10 Pages This Issue

Ninety individual advertisers feature an exceptionally large selection of used equipment in the 10-page "Clearing House" section which starts in this issue on page 103. Readers will find the "Clearing House" a dependable and informative directory of outstanding values in used equipment and we suggest that you make perusal of these pages a regular habit each month. At any time that you have equipment you wish to sell, anywhere in the country, we suggest that you present your offerings in our "Clearing House." This section is growing faster, getting larger every month, because it's doing a better, quicker selling job—at one low cost!

Traffic Sign Control Manual Published

Here are additional details on that important new document, "The Manual on Uniform Traffic Control Devices for Streets and Highways," which was announced briefly in September R&S. Prepared by the Joint Committee on Uniform Traffic Control Devices and published by the Public Roads Administration of the Federal Works Agency, it is on sale September 16 at the Government Printing Office at 50 cents a copy.

The Manual is the generally recognized official national standard covering highway signs, pavement markings, traffic signals, islands, and similar devices used in the guidance, warning, and regulation of traffic.

The importance of this work, and the need for its general adoption, will be obvious to any driver who has observed the lack of uniformity and the inadequacy of traffic control devices now used in many of our states and cities.

Many Agencies OK

The Joint Committee includes representatives of the American Association of State Highway Officials, the Institute of Traffic Engineers, and the National Conference on Street and Highway Safety (now the National Committee on Uniform Traffic Laws and Ordinances.) Its members are outstanding traffic engineers of state and city highway departments, the Public Roads Administration, and numerous national organizations concerned with highway use and safety. The Manual bears official approval of the three member organizations of the Joint Committee and also of the American Standard Association.

Thomas H. MacDonald, Commissioner of Public Roads, has approved the Manual as implementation of Section 12 of the Federal-aid Highway Act of 1944, which provides that signs, signals, and markings on roads and streets constructed with Federal aid shall be subject to approval of the state highway departments with concurrence of the Public Roads Administration. The law specifically directs the Commissioner of Public Roads to concur only in those installations that will promote the safe and efficient utilization of the highways.

Superseding editions of 1935 and 1942, the new Manual represents a 4-year effort of the Joint Committee and its staff. While basic standards generally remain unchanged, many refinements and some significant revisions have been made.

The text has been entirely rewritten and expanded to provide a clearer, more complete exposition of each subject. Proper usage of traffic control devices is illustrated by 57 drawings and photographs. In addition, 85 signs are portrayed in the margins alongside the appropriate text. Many of the drawings are in color.

National standards for traffic control devices go back to 1925, when the American Association of State Highway Officials began to lay out a uniformly marked system of interstate highways. From this work grew the familiar U. S. numbered highway system and its well-known shield marker.

In 1930 the National Conference on Street and Highway Safety adopted specifications for use of traffic control devices in cities. The two organizations created in 1931 the Joint Committee on Uniform Traffic Control Devices which produced, in 1935, the first Manual on Uniform Traffic Control Devices for Streets and Highways.

Many Years' Work

The Joint Committee published a set of amendments in 1938; and in 1942 issued the War Emergency Edition, basically a condensed version of the original manual and its amendments with adaptations to wartime blackout conditions. Work on the new edition was begun in 1944 by the Joint Committee and enlarged to include the Institute of Traffic Engineers as well as the two founding organizations.

The Manual on Uniform Traffic Control Devices for Streets and Highways can be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 50 cents per copy (a discount of 25% is allowed on orders of 100 copies or more). Payment must accompany orders. Orders should not be sent to the Public Roads Administration. No free distribution will be made.

Road Need Reports Submitted in Oregon and Washington

(*Continued from page* 87)

twenty year programs, but makes no recommendations other than to state that in the twenty year plan the "Law of diminishing returns" would be encountered.

The report, in calling for reclassification of roads, recommends that no more highway mileage should be added to the State highway system unless such mileage is of predominately state interest; that approximately 1,300 miles of present state secondary roads of county primary or local characteristics should be returned to the counties after a detailed study by the highway department; county roads should be classified into two systems: County Primary Roads and Local Roads, and the County Primary System be limited to 4,300 miles until a reclassification of the systems is made; city streets should be classified as Arterial Streets and Local Streets, and the Arterial System should be limited to 660 miles, with a provision that extensions may be made up to a total of 20% of the total street mileage of all cities. Uniform standards of street and highway construction should be developed for cities and counties in cooperation with the highway department, and all future construction should conform to those standards.

Army Offers Commissions to Transport Men

If you have had several years' experience in a supervisory capacity in the trucking industry, you may be eligible for appointment as a commissioned officer in the Highway Transport Service, Transportation Corps Reserve, United States Army.

In a recent order issued by the Department of the Army, any person with professional, technical or special qualifications and experience may, under certain circumstances, receive direct commissions in the Officers' Reserve Corps. This directive applies particularly to members of the trucking industry who may have an opportunity to serve in an affiliated unit of the Organized Reserve Corps.

Men with vehicle maintenance experience are also desired. For appointment as a highway transport vehicle maintenance specialist in the Corps Reserve, an applicant must have had experience in this field, grades of first lieutenant up to full colonel being available, depending on the length of experience and the length of supervisory experience.

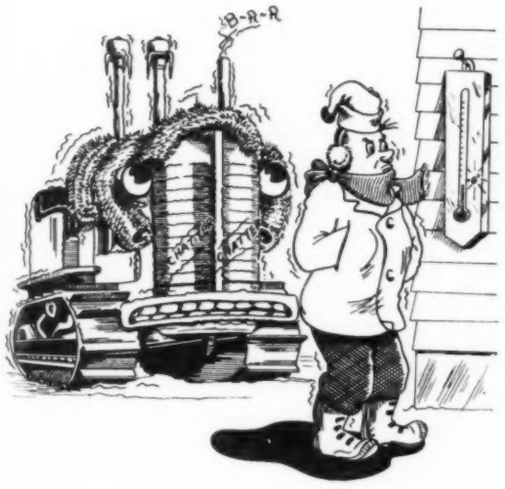
Commissions are also available for men who have had experience in directing the operation of transport vehicles. For further information and application blanks, interested individuals should contact their nearest Army recruiting office, National Guard or Reserve unit, or the Army commander.

More Highway Coal Hauling

More than 50% of the nation's coal now is hauled some part of the way to market over highways, according to figures from J. T. Calloway, president, American Road Builders' Association. Trucking of bituminous coal increased 46% from 1939 to 1946, the estimated tonnage for the latter year being 16,000,000. These figures do not include secondary hauling from retail yards to consumers.

A Few Tips on

Tractor Winterization



Each year, winter sabotages the cooling systems of tractors not serviced and protected to resist the elements. The Allis-Chalmers Tractor Service Department is aware of the importance of efficient "winterization" and, therefore, offers the following suggestions to contractors and highway officials anxious to maintain their construction schedules in spite of inclement winter weather

By R. W. Bogenberger
Allis-Chalmers Tractor Division
Milwaukee, Wis.

1. USE a permanent, ethylene glycol anti-freeze solution in the cooling system of your tractor because it has a boiling point higher than 185° F. You can then keep your engine at normal operating temperature of 160° to 185° F. without loss of solution. A mixture of 3 parts permanent anti-freeze and 2 parts water will provide maximum protection against freezing. Test the solution periodically to make sure it is strong enough for protection against the prevailing temperatures.

2. The thermostat keeps the engine operating temperature at 160° to 185° F. Be sure the thermostat is in good working order. Install a new thermostat and gasket if you are in doubt.

If your tractor is equipped with a radiator shutter, use it to assist in maintaining the proper engine operating temperature. Get a radiator curtain if you don't have the shutter. Good side plates are a great help in keeping the engine warm.

Winter Lubrication

3. When changing oil at temperature readings of 32° F. or below, use the SAE number recommended in the manufacturer's service manual. Too frequently, oil that is too heavy in cold weather will cause such a drag on the starting motor that the engine will not start even though the battery is in excellent condition.

4. The fuel you used last summer may be a little heavy for winter operation. Be sure the pour point is low enough to permit it to flow freely under the prevailing operating temperatures. For cold weather operations it has been found that lighter fuels such as No. 1 Diesel have a lower pour point and the cetane number is higher along with a low distillation end point. These are the things which determine easy starting and clean burning. See your favorite oil man. He can fix you up.

After you get the proper fuel, keep it clean and don't forget to drain those sediment sumps under the fuel tank every night before you leave the tractor.

Batteries and Electrical

5. Check all electrical connections and wiring to make sure they are in good condition. Be sure the generator is charging properly. Batteries are used much harder during the winter months and must be kept in good condition to prevent freezing. Here are some items to keep in mind:

a. Keep top of batteries clean.

b. Electrolyte should cover cell plates.

c. Check battery reading at frequent intervals.

d. In temperatures below 32 degrees, the specific gravity reading should not be allowed to go below 1.250.

6. Prolonged idling during cold weather results in low engine temperature. This will affect normal operation and damage operating parts. Some of the results of prolonged idling and low engine temperatures are: dilution of lubricating oil, lacquer or tar-like deposits on valves, pistons and cylinder liners causing abnormal engine wear and poor performance.

When the engine is started, it should be brought up to proper operating temperature and maintained during time tractor is in operation.

Just a Reminder

7. Don't forget to cover the exhaust pipe at night.

(*Continued on page* 102)

New Construction Equipment and Materials

1
Dump Wagon

A new rear dump wagon—the E-16 Tournarocker—announced by R. G. LeTourneau, Inc., Peoria, Ill., is powered by the new 150 HP Model C Tournapull. The new Tournarocker has a struck capacity of 16.5 yd. or 16 tons. Its wide top opening and low body—only 6½ ft. high—permit easy spotting at shovel. The load is carried

Model E-16 Tournarocker Dumping

down between the wheels, giving a low center of gravity for greater stability. The unit has positive power electric steering plus a 90° turning radius. It is able to turn around in a 12½ ft. radius. Forward speeds range from 2.19 to 17.3 mph; reverse speeds from 2.19 to 4.38. Specifications for the E-16 Tournarocker include: overall length 26 ft. 1 in.; overall width 9 ft. 8½ in.; width 10 ft. 3½ in.; bowl 7 ft. 10½ in. wide by 11 ft. 2 in. long; wheelbase 15 ft. 3 in.; weight 28,500 lb.

2
Grid Roller

A new type roller, called the Grid Roller, developed for the compaction of fill materials, subgrades and stabilized base courses, is being manufactured by Gardner-Byrne Construction Co., 649 South Olive St., Los Angeles, Calif. The device is essentially a 5-ft. diameter wheel made of

Self-Propelled Grid Roller

heavy cast steel segments that are individually replaceable. The surface has the appearance of being a woven open-mesh grid made by interlacing 1½-in. diameter bars with 3½-in. square openings between adjacent bars.Each unit contains a simple mesh-cleaning device, and provision for varying the weight to increase or decrease the applied pressure is optional. The equipment is offered as 5-ft. width double section tow units, which can be used singly or in multiple combinations, or as an 8 m.p.h. self-propelled assembly covering a 10-ft. width, as illustrated.

3
Tractor Shovel

A new Payloader has been added to the line of tractor-shovel units of The Frank G. Hough Co., 801 D Sunnyside Ave., Libertyville, Ill. This new unit, Model HM Payloader, features a revolutionary four wheel drive and a power boosted steering mechanism. The Model HM is the biggest of the Payloader line, having a bucket capacity of 1½ cu. yd. and a static loading capacity of 6,000 lb. Its 76 h.p. engine, four wheel drive and large 14.00-24.00 road builder tires on all four wheels provide the power, traction and flotation necessary for successful off-road operation. Both the bucket-raising-and-lowering and bucket-dumping-and-closing is accom-

Model HM Payloader

plished by double-acting hydraulic rams, fingertip controlled. An automatic quick tip-back of the bucket is provided as it is raised so that heaped loads can be retained without spillage and can be carried low for good machine balance and full operator visibility.

4
New Luminaire

A new luminaire designed to distribute light from large mercury and incandescent lamps with a minimum of glare has been announced by General Electric's Lighting and Rectifier Divisions, Schenectady, N. Y. Designated as the Form 109, the new luminaire is available in a wide variety of mountings, including the slip fitter type in 1¼-in. and 2-in. sizes. It will accommodate the G-E 16,000-lumen Type FH-1 and 21,000-lumen Type EH-1 mercury lamps in a horizontal position or the 7-in. and 9½-in. light center filament lamps. Glare, on the street and driver approach sides, has been reduced by low-angle shielding of the light sources and by a specially designed optical system which distributes light to the roadway where it is most needed.

5
Trailer

A tilt type trailer introduced by Foster Trailer Co., 2029 Sacramenta St., Los Angeles, Calif., is claimed to be so designed as to enable a trailer and flat bed truck to be loaded with equipment in less than 12 minutes without the use of special loading

Foster Trailer Being Loaded with Construction Equipment

ramps. These new trailers feature three exclusive Foster developments which make the double loading possible—automatic cribbing brakes to prevent movement of the trailer while loading, an automatic hydraulic tilting control cylinder to allow the trailer bed to tilt gently under loads, and Foster loading-aid hooks which are placed in recesses on the truck bed to help in moving the equipment across the trailer to the truck bed. The new trailers are available in two primary types, tandem and single axle, and in 14 production models. Special designs are also available.

6
Ratchet Box Wrenches

New alloy ratchet box wrenches have been announced by Owatonna Tool Co., 319 Cedar St., Owatonna, Minn. Five double-end wrenches—¼ in. x 5/16 in., ⅜ in. x 7/16 in., ½ in. x 9/16 in., ⅝ in. x 11/16 in. and ¾ in. x ⅞ in.—provide a

New Ratchet Box Wrench

range which is extremely useful for automotive, tractor, aviation and industrial maintenance.

7
Alternator System

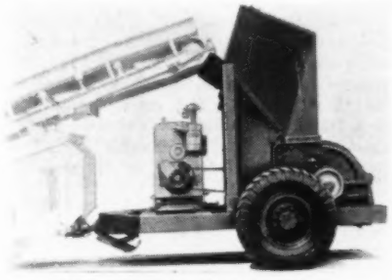
The 6-volt rectified AC alternator system of the Leece-Neville Co., Cleveland, O., is now available in versions delivering maximum outputs of 45 and 80 amperes. Hitherto the lowest maximum output system delivered 60 amperes. The 45 and

80 ampere units were developed to meet the needs of a wider range of users than was possible with the 60 ampere system alone. The 45 and 80 ampere systems feature the same high output at low and high speed characteristics of the 60 ampere unit. The systems deliver from 25 to 35 amperes at engine idling; maximum output at from 12 to 15 miles an hour. An added advantage of the new 45 ampere system, which sells at a somewhat reduced price, is simplified installation.

8

Portable Crushing Unit

A new portable crushing unit has been introduced by Athey Products Corporation, Chicago, Ill., for use with the Athey force-feed loader. Designed primarily to



Athey Portable Crushing Unit

tow behind the loader, the one man operated unit picks up scarified or broken material from the road, crushes it and deposits it back on the roadway in one continuous operation. The unit consists of an impact mill powered by a "Caterpillar" diesel engine, mounted on a two-wheel, rubber-tired trailer. A multiple V-Belt drive connects the engine with the mill. Overall length of the new unit is 13½ ft.; width 94 in.; height 11½ ft. Shipping weight is approximately 14,000 lb.

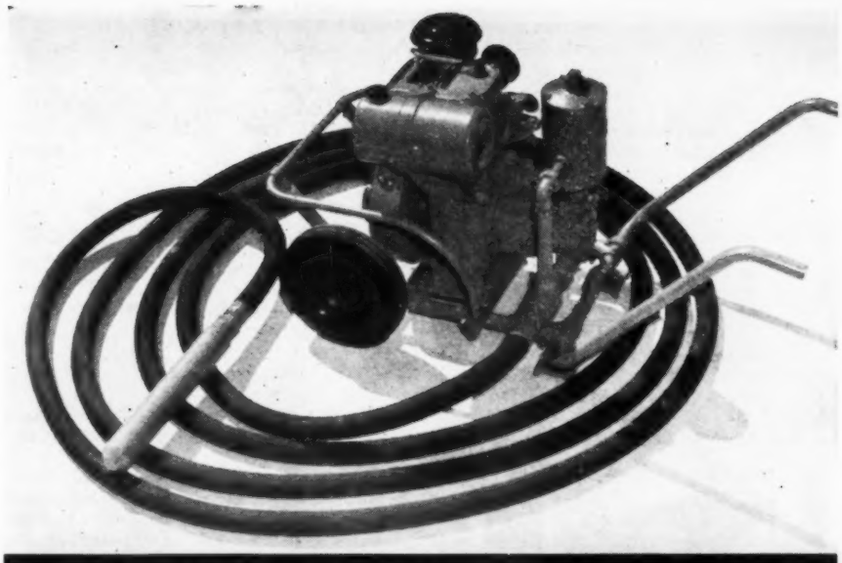
9

Geophysical Prospecting Instrument

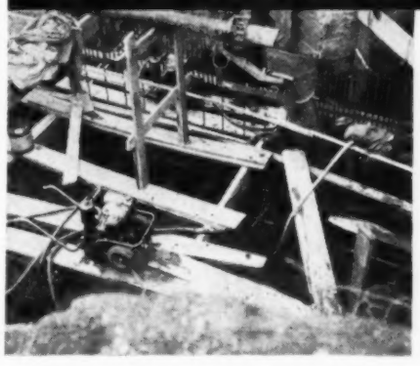
An instrument, Vibroground Model 258, announced by Associated Research, Inc., 231 South Green St., Chicago, Ill., has been developed to provide an accurate, easy to operate means of geophysical

Vibroground Model 258

prospecting by means of the four point method. Useful in mining operations for establishing the boundaries of mineral, ore or oil deposits, the Model 258 can also be employed in determining the sub-

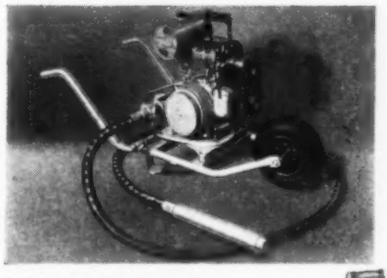


THE JACKSON HYDRAULIC



Saves a "WHOPPING" amount of time and effort!

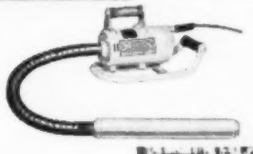
When you place this concrete vibrator, ***with its 50 ft. reach,*** on the job, every bit of concrete poured within a 100 ft. circle can be thoroughly vibrated without changing the location of the machine; the hard-to-get-to places become quickly accessible, non-productive time is drastically cut and the job proceeds faster and more profitably. Tough, trouble-free and highly efficient. Write for complete details.



OTHER JACKSON VIBRATORS TO SOLVE EVERY VIBRATING PROBLEM — PERFECTLY!

Internal and external types — for thin sections to mass construction — highway, airport and municipal paving — product manufacture. See them at your Jackson distributor or write for literature and our recommendation for any particular type of job.

Model FS-6A. Flexible shaft, Gas-engine drive. Available with 3 heads for thick or thin sections. Flexible shafting in 7' to 14' lengths up to 28', grinding and other attachments.



Model FS-7A. Flexible shaft, Electric. Ideal for decks, thin walls and with short shafts for spud work.

MUNICIPAL PAVING UNIT. Manually guided paving machine and portable power plant. Easily places upward of 65 cu. yds. of stiff mix concrete per hour. Undercuts at side forms. Strikes off to crowns, regular and inverted; works around manholes, etc.

ELECTRIC TAMPER & EQUIPMENT CO., Ludington, Michigan

surface structure for projects such as dams, tunnels or for investigations in hydroelectric or highway engineering. The location of material (clay, sand, gravel, etc.), the water table level or the depth to bed rock can also be determined by means of the four point method. Corrosion engineers can also use the Model 258 because it has the speed and accuracy essential for corrosion investigations along oil, gas, gasoline or water pipe lines.

10

Batchers

Two new batchers for road builders are now being manufactured by The Heltzel Steel Form and Iron Company, Warren, O. The 2½ cu. yd. capacity dual aggregate batcher and the 28 cu. ft. capacity dual cement batcher are stated to eliminate one or more truck stops at the plant, providing faster material handling service for highway contractors. Bulletin J-40 (Dual Cement Batcher) and Bulletin J-44 (Dual Aggregate Batcher) describing the operation are available from the manufacturer.

Heltzel Dual Cement Batcher

11

New Small Tournapull

The Model D Roadster Tournapull, a new, small sized unit, has been added to the line of earthmoving equipment of R. G. LeTourneau, Inc., Peoria, Ill. Powered by 100 h.p. diesel or gas engine, this prime mover, which travels at speeds up to 25 m.p.h., is used with the E-9 Carryall scraper, a 9 ton or 7 cu. yd. heaped capacity unit. A feature of this new Tournapull is the complete control of all steering and scraper operations by individual electric motors. Operator steers and handles all scraper controls by means of toggle switches located on the Tournapull control panel. Another feature incorporated in this machine is a torque proportioning differential which automatically supplies power to the wheel on the firmest footing. Specifications include: length, 27 ft. 10¾ in.; width, 8 ft.; height (with cab) 8 ft. 6¾ in.; width of cutting edge, 7 ft.; wheelbase, 15 ft. 7⅞ in.; weight, 20,700 lb.

Model D Roadster Tournapull

12

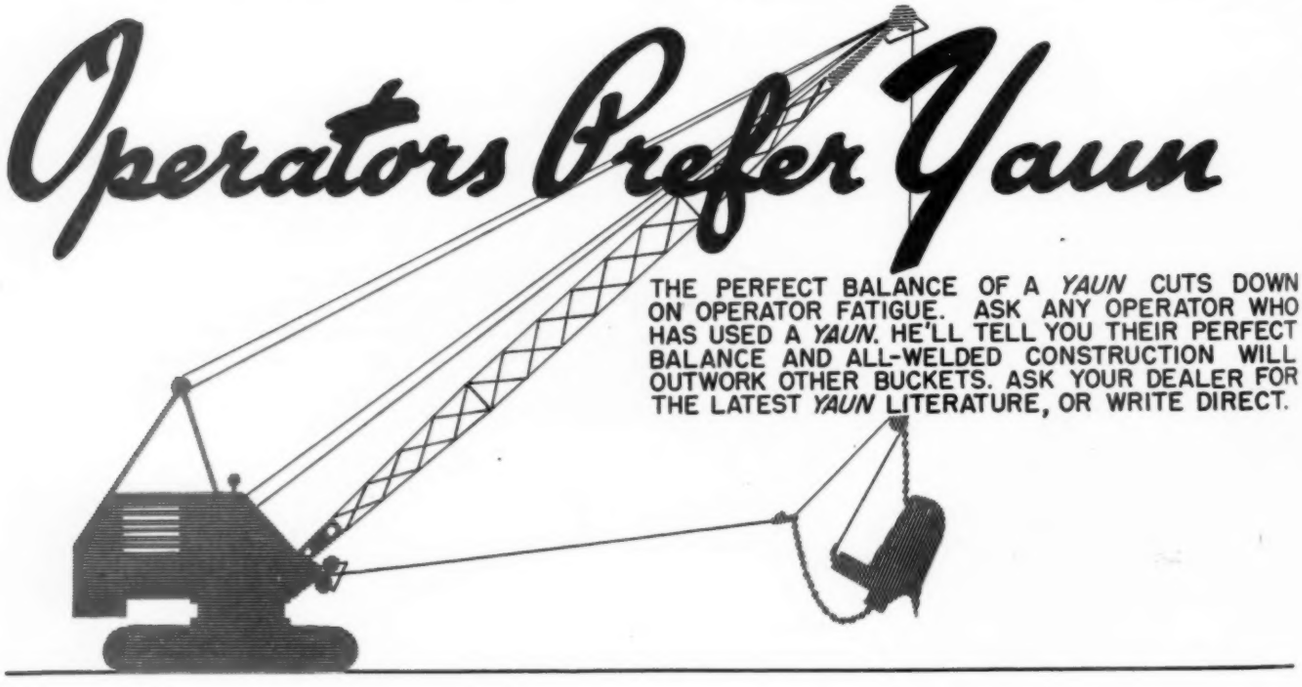
Wagon Drill

A new wagon drill, BW-1, equipped with the new Thor Model 105, 1¼ in. drifter rock drill, has been announced by Independent Pneumatic Tool Co., Aurora, Ill. The wagon drill features a single reversible pneumatic motor that feeds and raises the drill. The motor driven feed also permits throttle control that allows the feeding speed of the drill to be reduced when necessary. The drill's mast can be swung 360 degrees vertically or horizontally to permit drilling of holes at any angle. The tubular frame of the rig serves as an air receiver, maintaining a continuous supply of air pressure. The new Thor drill steel centralizer centers the drill steel with the drifter drill chuck. Model BW-1 has a nominal steel change of 6 ft.; an actual feed travel of 8 ft.; a regular road gauge of 4 ft. 8½ in.; its road gauge with wheels swivelled inside is 3 ft. 4½ in.; length of rig is 8 ft.; its greatest width is 5 ft. 10 in.; height when drilling down holes is 10 ft. 6 in.; weighs 1425 lb.; and its weight when crated for shipment is 1725 lb.

13

Motor Grader

A new AD-4 motor grader introduced by Allis-Chalmers Manufacturing Co., Tractor Division, Milwaukee, Wis., incorporates many features of earlier AD models in addition to new developments. Matching the rugged structure of the new 22,140 lb. AD-4 is a 104 brake h.p. General Motors 2-cycle Diesel engine. Important among the exclusive features of the AD-4 is the


Operators Prefer Yaun
THE PERFECT BALANCE OF A YAUN CUTS DOWN ON OPERATOR FATIGUE. ASK ANY OPERATOR WHO HAS USED A YAUN. HE'LL TELL YOU THEIR PERFECT BALANCE AND ALL-WELDED CONSTRUCTION WILL OUTWORK OTHER BUCKETS. ASK YOUR DEALER FOR THE LATEST YAUN LITERATURE, OR WRITE DIRECT.
YAUN
DRAGLINE BUCKETS AND MFG. PLANT
BATON ROUGE, LA.

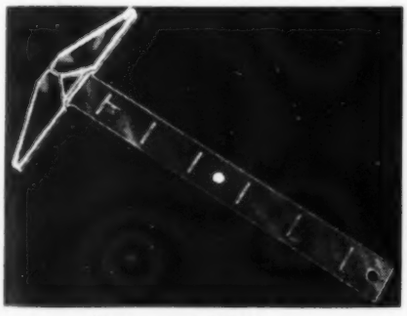
special tubular frame design developed and introduced by Allis-Chalmers. A complete blade range is accurately achieved by hydraulically controlled front mounted lift cases which provide direct down pressure and allow cuts measured to a fraction of an inch. The grader has a 30 in. throat clearance and the involute design of the exclusive Allis-Chalmers "Roll-Away" moldboard. Designs that reduce fatigue and

AD-4 Motor Grader

improve operator performance are numerous. An operator platform is built for improved visibility, fewer grease points facilitate fast, efficient service care, and a mechanical system of circle control enables the operator to obtain exact sittings. Accessible controls and convenient gear shifting arrangement that give six speeds forward ranging from 2.4 m.p.h. to 16.6 m.p.h. and three reverse speeds ranging from 2.8 m.p.h. to 6.2 m.p.h. contribute to greater operator efficiency and increased production.

14
T-Square

A new T-square, placed on the market by Instrumenter Industries, 2458 West Jackson Blvd., Chicago, Ill., is constructed to provide longer life, continued accuracy, complete view of the work area on which the T-square is placed, and reduced possibility of smudging the working surface. Advantages claimed by the manufacturer: The T-square is molded in one integral piece of shatterproof plastic. The clear

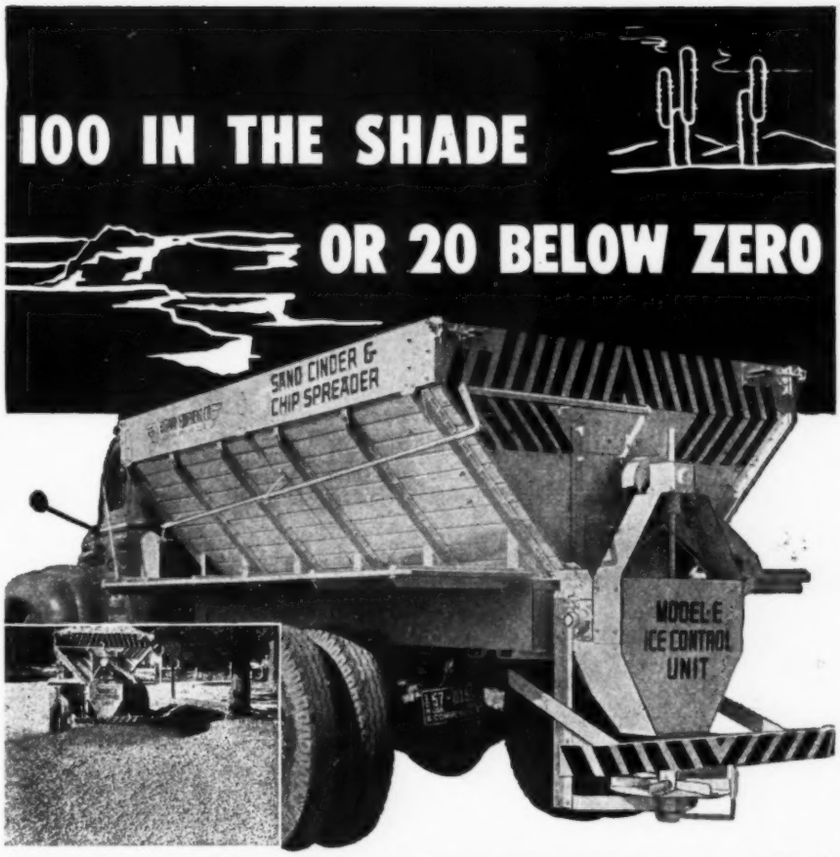


"Instrumaster" T-Square

plastic permits full visibility of the surface on which the T-square is placed, providing an unobstructed view of the whole area. Both sides of the T-square are equally usable, offering greater convenience and twice the life. The ribs, which are protruded .020 above and below, enable the T-square to be moved across the working surface more smoothly. In addition, users drawing with ink do not have to be concerned about smearing the writing fluid.

15
Road Sweeping Magnets

A recent new design of Dings high intensity road sweeping magnet now in production by Dings Magnetic Separator Co.,



THERE'S A JOB FOR THE ALL-PURPOSE HIGHWAY MODEL "E"

● Spreading sand and cinders for ice control on streets, highways airport runways, etc. ● Spreading calcium chloride for dust control on secondary roads, parking lots, airports, fair grounds, etc. ● For seal coat work, spreading chips, sand, etc., over newly laid oil or blacktop ● Patch work spreading ● Spreading commercial fertilizers in parks, on lawns ● Hauling crushed rock and chips ● General road and shoulder maintenance

14 OUTSTANDING FEATURES THAT SAVE TIME, MATERIAL AND MONEY

1. Uniform spread at all speeds.
2. Covers 2 or 4 lane highway in one operation.
3. Spreads material on highway where needed. No material wasted on shoulders.
4. Operates forward or reverse.
5. Spreads to right, to left, or both sides as desired.
6. Material is cast low to ground—no interference with traffic.
7. Spread may be started or stopped with truck in motion.
8. All controls within easy reach of driver's seat—one-man operation.
9. Material is also spread ahead of rear wheels of truck assuring traction and safety at all operating speeds.
10. Electrically welded all steel frame.
11. Wooden hopper eliminates corrosion from chlorides, assures longer life; also wet material won't freeze to sides in cold weather as is often the case with a steel hopper.
12. Pall bearing gear boxes, oil tight, dust and water proof.
13. Self-unloading 24" wide conveyor assures steady material flow.
14. Hopper sides hinged for easier hand loading.

The Highway Model "E" Spreader is made in 9, 11, 13 and 15 ft. lengths—easily mounted on any standard truck chassis. Other lengths made on special order. Write for literature—today.

SOLD AND SERVICED BY LEADING CONSTRUCTION MACHINERY DEALERS THROUGHOUT THE UNITED STATES, CANADA AND FOREIGN COUNTRIES

HIGHWAY EQUIPMENT COMPANY, INC.

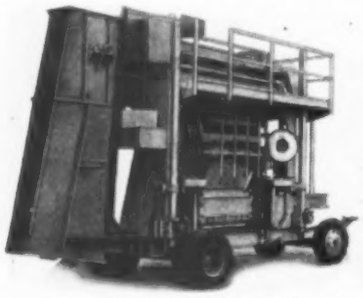
Manufacturers of world's most complete line of spreaders

605 D. Avenue N. W. Cedar Rapids, Iowa

4740 W. McGeogh Ave., Milwaukee, Wis., has a powerful triple pole feature, with the magnetic field effective up to 12 in. from the magnet face. Intense power across entire magnet width is stated to assure positive pickup of iron. Units operate on direct current which can be supplied from a gasoline motor generator set mounted on the truck. The 96 in. magnet, weighing 2800 lb., requires only 2000 watts to provide the tremendous surface strength and penetration depth of its magnetic field. Shorter magnets are also available.

16
Portable Asphalt Plant

A completely portable asphalt paving plant which rolls on its own wheels from job site to job site and has a capacity of 30 to 40 tons per hour of bituminized aggregate is now being manufactured and



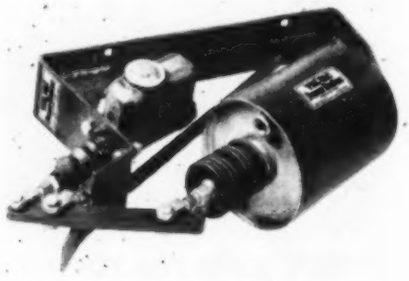
1000-lb. Madsen Asphalt Paving Plant

marketed by Madsen Iron Works, Inc., Huntington Park, Calif. Easy to erect, this portable plant is equipped with the Madsen-patented jack legs on all four corners, making it possible to erect the plant to its full operating height in 2½ to 3 hours without the assistance of a crane, jim poles or skids. A single source of power, either electric motor or diesel engine, operates all parts of the plant, including the cold-stone elevator, dust-elevator and screw, vibrating screen, pug mill mixer and pressure-injection pump. Only the lower half of the elevator is removed when the unit is prepared for travel. Made in two sections, the upper section slides on greased rails. A chain hoist installed on the equipment raises the upper section of the elevator to operating position, and lowers it to transport position. Bucket chain is not removed.

17
3rd Axle Booster

A new 3rd axle vacuum hydraulic booster assembly to provide supplemental braking for trucks up to 2½ or 3 tons capacity has been announced by Velvac Inc., 3530 West Pierce St., Milwaukee, Wis.

The assembly includes a 6 in. vacuum power cylinder, a 1⅛ in. hydraulic master cylinder, a mounting bracket and leverage



Velvac 3rd Axle Booster

to deliver a line pressure of 800, 900 or 1000 lbs. The complete assembly can be installed simply and inexpensively on the trailing axle without the necessity of removing the vacuum hydraulic power system already in use on the truck.

18
Triple Roll Crushing Plant

New in the line of portable crushing plants manufactured by Pioneer Engineering Works, Minneapolis, Minn., is the 4309 Secondary crusher which consists of a triple roll crusher with feed hopper and delivery conveyor mounted on a chassis equipped with eight pneumatic tires. The triple roll crusher has three rolls to give a double pass of the material. The crusher is a size 40 x 22. The delivery conveyor is 30 in. in width by 20 ft. long and delivers the crushed material into trucks over the front end of the plant. The plant has an equalizer between the two rear axles and is equipped with 10.00 x 20 tires as standard. Where desired the rear wheels can be equipped with eight 9.00 x 20 tires, dual mounted. Brakes can be furnished with mechanical, vacuum, or air control. The front bolester is removable, allowing for semi-trailer hitch. A feature of the triple roll crusher is the positive gear drive using chrome-molybdenum star gears which provide proper tooth contact for any adjustment of the rolls. Roll wheels are cast manganese steel to resist abrasion and uneven wear. Alloy steel safety springs guard against damage by tramp iron or other non-crushable substances. The plant, without power unit, weighs approximately 40,000 lb. Provision has been made for a plant mounting of a 110 to 125 h.p. continuous duty power unit. The overall length of the plant is 30 ft. 9 in.

Cut your Asphalt Costs

on those small mix jobs!

The Foote Kinetic Asphalt Mixer with its new, unusual method of mixing will give you eight to ten batches more per barrel of asphalt in less time than any other method. This saving will soon pay for the mixer!

Remember, too, that it is fully portable, can be towed behind any truck or car, handles any cold mix without additional equipment and can handle hot mixes in conjunction with kettles.

Capacity 3 cu. ft. in 30 seconds. Ask for Bulletin K-100 describing the mixer and mixing method in detail.

THE FOOTE COMPANY, INC.

1936 State Street • Nunda, New York

Subsidiary of Blaw-Knox Co.

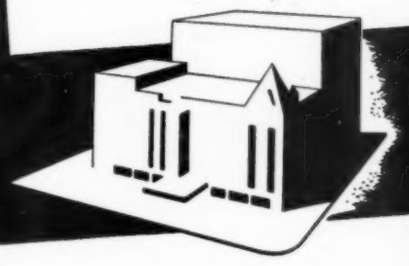
the FOOTE Kinetic mixer

Builders of...

Adnun Black Top Pavers
MultiFoote Concrete Pavers
and Foote Kinetic Mixers

1000 ROOMS IN

CLEVELAND

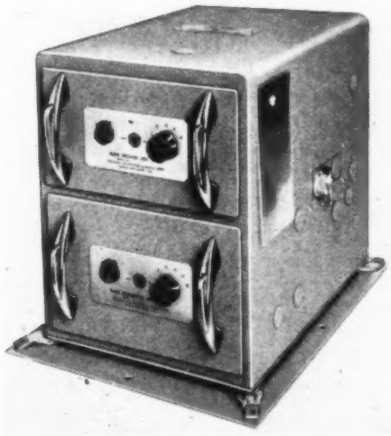


HOTEL HOLLENDEN

ROBERT P. JOYCE, GENERAL MANAGER

19
Mobile Communications Equipment

Instantaneous voice communication between supervisory personnel and service vehicles is claimed for FM mobile radio equipment by Federal Telephone and Radio Corporation, Clifton, N. J. Combining compactness with sturdy construction; ease of installation with ready accessibility to all components for inspection and servicing; economy of operation with low maintenance cost, Federal's mobile communications equipment is stated to meet every demand placed upon it. A solution to operational problems is offered by an ingenious circuit, known as the "Selecto Call" system, which can be supplied upon request. This system permits the central office to contact one or more mobile units without disturbing any of the others. A single dust-proof, shock mounted metal case, 9⅝ in. wide, 11⅞ in. high, and 13½ in. long, houses both the transmitter and receiver. With no connecting cables between units, the space required for installation has been reduced to a minimum. Another feature of Federal's mobile equipment is its "desk drawer" accessibility plus interchangeability wherein either receiver or transmitter can be replaced in a matter of minutes.



Mobile Communications Equipment

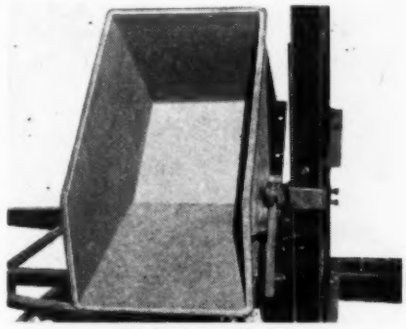
20
Snow Loader

A new swivel belt conveyor designed to speed snow removal regardless of traffic conditions is the outstanding feature of Haiss snow loader, Model 300 WS-SBC, produced by George Haiss Mfg. Co., Inc., New York, division of Pettibone Mulliken Corp., Chicago. Swinging through an arc of 22 ft., the swivel conveyor permits snow to be discharged to trucks on either side of the loader. It extends over the highest truck cabs; therefore trucks driving either forward or backward under the conveyor extension can be loaded quickly to full capacity. The loader itself is designed for easy maneuverability so that it can clean up close to parked cars, discharging snow to a truck at either side or rear. Like the other Haiss snow loaders, Models 75 WS (wheel mounted) and 75 CS (crawler mounted), the Model 300 WS-SBC has heavy feeding propellers which chop and lift as they dig, a patented Haiss principle for handling wet, dry or hard-frozen snow. The machine is stated to have a capacity of 15 to 20 yd. per minute.

Model 300 WS-SBC with New Conveyor

21
Dumping Bucket

A new all-steel dumping bucket with a roller attachment which trips the bucket for dumping at any desired height, has recently been introduced by the O.K. Clutch & Machinery Co., Columbia, Pa. Attachment of the bucket and roller are simply performed in a few minutes time. Primarily intended for use with the O.K. Portable elevator, but can be obtained as a separate unit.



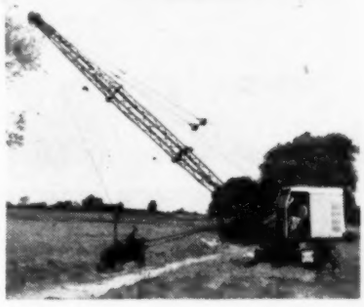
OK Dumping Bucket

This "Old-Timer" has Outlived Many Fleets of Trucks

The New *Generals* Are "Tough," Too!

FIFTEEN YEARS AGO this ⅝-yard General was given a "tough" assignment—in the clay pit of Linhardt Bros., Mt. Sterling, Mo. Clay rock, so hard it has to be dynamited and so slippery when wet you can't get a footing on it, is difficult to handle. Slick, heavy, rolling boulders are elusive . . . hard for an operator to pick up.

But this old General has been doing the job satisfactorily, efficiently, ever since it started. It still takes a full dipper every swing—can load a 5-yard truck with only seven passes. During its long service, Linhardt Bros. have replaced truck fleets many times, but the General keeps right on loading!



***New Generals are "tough," too*—give the same dependable performance, and, in addition, incorporate numerous advancements in construction and design that mean extra economy of operation, extra profits in use. Write for information and specifications.**

POWER SHOVELS • CRANES • DRAGLINES • CLAMSHELLS • BACKHOES • PILE DRIVERS

THE OSGOOD CO. O-G THE GENERAL CO. EXCAVATOR

MARION OHIO

DIESEL GASOLINE OR ELECTRIC POWERED • ⅜ TO 2½ CU. YD. • CRAWLERS & MOBILCRANES

IMPROVED OWENS

A MOUTHFUL AT EVERY BITE

DIG for IMPROVEMENTS ...EVERYWHERE

Long experience and intensified experimentation has enabled Owen engineers to originate designs, utilize special alloys and develop methods of manufacture that reduce weight, increase strength and provide greater wear resisting qualities.

"Owen Clamshell Buckets Insure a Bigger Day's Work."

The Owen Bucket Company
6070 Breakwater Avenue, Cleveland, Ohio
Branches: New York • Philadelphia • Chicago • Berkeley, Cal.

ICE & SNOW CONTROL

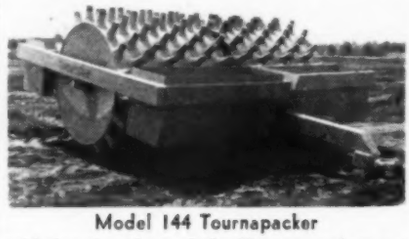
CHEMICAL SPREADER

Clear chemicals are *cheap* and *effective* when applied with a "Scotchman." Used on dump trucks or pick-ups. Removable in three minutes. Bagged or bulk materials. Filtered air cools enclosed engine. Pushbutton starting and lights. Accurate control of application rates saves material. Instant control of width and direction of spread. Self-leveling. Stainless steel.

TARRANT MFG. CO.
SARATOGA SPA, N.Y.

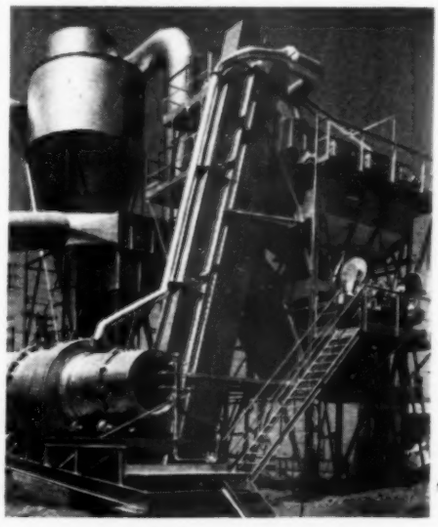
22 Roller

A new compaction roller, the Model 144 Tournapacker, has been announced by R. G. LeTourneau, Inc., Peoria, Ill. Utilizing all the power of the towing unit, the Tournapacker is claimed to give required compaction in fewer passes because of the wide range of compaction pressures which are available. Ground pressure can be varied from 218 lb. per square inch to 670 psi. by filling the drum with water and loading attached boxes with sand. The



Model 144 Tournapacker

self cleaning feet of the Tournapacker are made of tool steel forging, tempered glass hard. They have a square base which tapers off to a round tamping surface of 8 sq. in. This two-drum unit is of box-beam construction and rolls on heavy duty, dust and water proof bearings. There are 4 feet in a row, 144 feet on the drum. Overall measurements include: length, 16 ft. 9½ in.; width 13 ft. 7½ in.; height, 6 ft. 4½ in.; weight (empty), 14,000 lb.; (loaded with water) 27,300 lb.; (loaded with water and sand) 42,883 lb. For exceptionally high compaction requirements, the Model 108 Tournapacker is available with 108 feet per drum and correspondingly greater ground pressures ranging to 900 lb.



AMERICA'S FINEST PAVING PLANT

STANDARD is one of the oldest and largest builders of paving plants—seven sizes to meet all conditions. Used throughout the world. Modern, Unit-built, easy to erect and transport. Immediate delivery.

Write for Catalog

STANDARD STEEL CORPORATION
5003 Boyle Avenue
LOS ANGELES - - - CALIFORNIA

"It's a Tough Fight, but" . .

. . Mud or Muck, the TROJAN welterweight WINS

Here's a patrol-grader that's tops with contractors. It's fast on its feet, easily maneuverable in tight corners, ideal for haul roads, clean-up and finishing work. It has the heft, power, traction and flotation for practically any job. You'll find it's a mighty handy, cost-saving piece of equipment to own. Ask your Trojan distributor for ringside details on the Welterweight or write

CONTRACTORS MACHINERY CO., INC., BATAVIA, N.Y.

23
Portable Primary Crusher

A new portable primary crushing plant, designated the No. 153PR, built by Pioneer Engineering Works, Inc., Minneapolis, Minn., has a 3042 overhead eccentric jaw crusher with a 42 in. x 14 ft. 3 chain apron feeder, mounted on a 3-axle chassis equipped with 12-12.00 x 20 pneumatic tires. A 30 in. x 25 ft. built-in conveyor delivers the crushed material over the front end of the plant. Standard equipment includes a bolster for the front wheels. This can be removed to permit use of a semi-trailer hitch for moving, if desired. Hydraulic brakes on four rear wheels are optional. The overall length of the plant is 40 ft. 6 in. Weight without "on plant" power unit is approximately 79,000 lb. Power required for operation is 125 h.p. continuous. An interesting feature of this plant is the simplicity of design which allows for a minimum of dismantling for moving. The feeder can be raised or lowered readily by means of two hydraulic rams actuated by a single Blackhawk pump.

MANUFACTURERS' LITERATURE

24
Chain Saws

A specification sheet describing a new gasoline-engine-powered chain saw is available from McCulloch Motors Corp., 6101 W. Century Blvd., Los Angeles 45, Calif. Power of the saw is 5-hp, and blade lengths of 20, 36, 48, and 60 inches can be furnished. Applications of the saw are stated to be numerous in the construction, lumbering, railroad, mining, farming and other industries where wood cutting and land clearing are important.

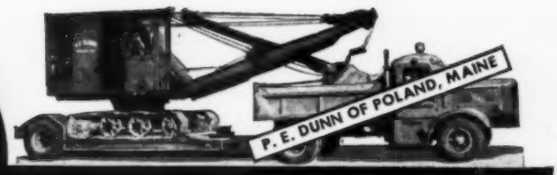
25
Electric Plants

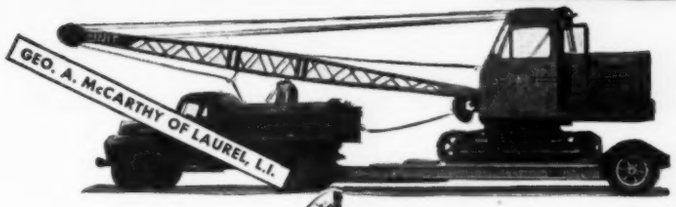
A new catalog, covering the complete line of Onan electric plants, including many new models, has been issued by D. W. Onan & Sons, Inc., Minneapolis, Minn. The 20-page, 2-color booklet contains a Model Guide to assist in the right selection of electric plants. This guide points out the difference between A.C., D.C. and battery charging models and gives instructions for choosing the proper type, size and starting method. A general information section gives statistics on watts required by electric appliances and motors.

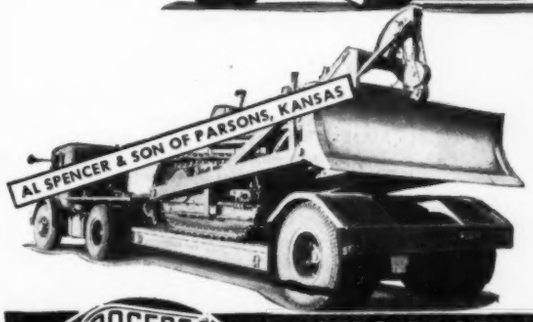
26
Concrete Testing Machines

A bulletin issued by Baldwin Locomotive Works, Testing Equipment Department, Philadelphia, Pa., gives illustrated descriptions of two cement and concrete testing machines of 90,000 and 300,000 lb. capacities. These machines were designed primarily to make the tests required by A.S.T.M. specifications. The bulletin describes construction and operation, the weighing and indicating systems, accessories and applications, and includes specifications.

JUST 3 OF MANY Satisfied ROGERS 'TAGALONG' OWNERS







who are profitably hauling light and medium shovels, cranes, bulldozers, etc., to and from the jobs with their dump truck serving as the tactor.

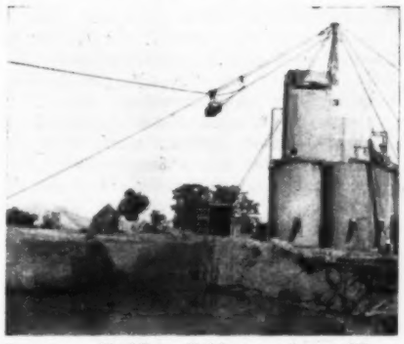
The "Tagalong" front loader loads and unloads from the front after trailer is easily disconnected from the dump truck, and it can be a "one man operation" performed in short time.

Write for literature and prices on this versatile trailer.

ROGERS HEAVY DUTY Gooseneck Trailers

ROGERS BROTHERS CORPORATION
DESIGNERS and BUILDERS of HEAVY DUTY TRAILERS
SINCE 1915
110 Orchard St., Albion, Penna.

Move More Pay Yards Per Year
AT LOWER COST



Sauerman Slackline Cableway above lifts gravel from deep under water to top of plant.

SAUERMAN
"ONE MAN CONTROL"

LONG RANGE EXCAVATORS

In a Sauerman Excavator you get a profitable combination of digging power, haulage speed, economical operation and long reach.

There are two types of Sauerman Excavators—the Slackline Cableway for digging deep and lifting to a high point, the Power Scraper for general long haul excavation jobs and stock-pilling. Either type of Sauerman machine can be operated by any mechanic. Upkeep cost is moderate; power requirement light. Simple design and sturdy construction guarantee long dependable service.

Send for catalog. If your problem is difficult ask our advice—40 years' experience.

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all sizes and types

AIR	DISCHARGE	STEAM
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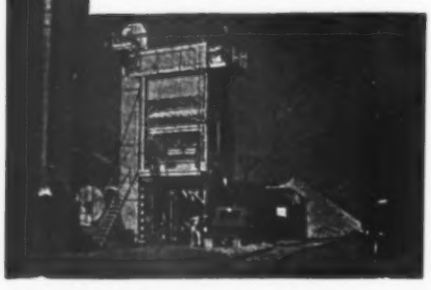
PORTABLE ASPHALT PLANTS

High Production—Low Cost



THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

27
Tractor

A 24-page catalog featuring the Allis-Chalmers HD-5 crawler has been released by the Tractor Division, Allis-Chalmers Manufacturing Co., Milwaukee, Wis. First, attention is given to the HD-5's A-frame track stabilizer design which absorbs shock, eliminates twisting strains and provides rigid track alignment. Photographs and cutaway views illustrate the "5's" track release mechanism, positive sealed truck wheels and tapered roller bearings. A detailed description is given of the HD-5's transmission. A cutaway view illustrates a capacity 14 in. master clutch. A page of illustrations focuses attention on other outstanding qualities.

28
Shovel-Crane

Two new catalogs have been published by Link-Belt Speeder Corp., Cedar Rapids, Ia. Book No. 2335 covers Link-Belt Speeder, HC-70 truck-mounted shovel-crane data, with "on location" photographs, complete specifications, clearances, capacities, and working ranges. This new book on truck-mounted shovel-cranes is loaded with interesting information. Book No. 2259 covers the 1½ yd. Link-Belt Speeder crawler-mounted shovel-crane models K-360 and K-365 equipped with Speed-O-Matic hydraulic controls. This book contains many application photos, specifications, clearances, and working ranges.

29
Diesel Engines

A new 24-page, profusely-illustrated booklet issued by International Harvester Co., Chicago, Ill., presents in graphic feature style the design features, specifications and work capacities of International diesel engines. Six International diesel engines, from the 39 HP UD-6 to the new 180 HP UD-24, are described and shown. Illustrations show the engines stripped, as well as with various attachments. Accompanying performance charts reveal the peak, intermittent and continuous horsepower, and peak and intermittent torque at different engine speeds, as well as the average fuel consumption with wide-open throttle under intermittent load. A separate "work it will do" table provides convenient listing of engine capacities in operating rock crushers, generators, hoists, sawmills and pumps. Specifications and dimensions of International diesel power units in easy-reference comparative tables are also included in the booklet.

FLINK SPREADERS

Unquestionably the finest hydraulic spreader.

Hundreds more transportation companies, cities and counties are using Flink Spreaders to spread granulars in ice control and highway maintenance work. Spread forward or backing up, full or half width of street. Controlled from cab. Write for literature.

FLINK CO. Dept. S-10 Streator, Ill.

30
Road Maintainer

A circular on its Meco triple action Roadmaster has been issued by Maintenance Equipment Co., 90 Dexter Road, East Providence, R.I. The machine has a primary mixer and scarifier blade of independent evenly spaced teeth; a secondary mixing and rough shaping blade of segmented, spring tensioned sections; and a solid widely-adjusted finishing blade.

31
Carryable Generators

A new 12-page bulletin describing their complete line of Carryable gasoline-engine-driven generators has been issued by Homelite Corporation, 2408 Riverdale Ave., Port Chester, N.Y. The bulletin shows, in words and pictures, the many uses for carryable electric power. Complete structural details of the Homelite generators are described and illustrated with cutaway photographs. The complete line of Homelite generators includes units from 500 to 5000 watts, weighing from 57 to 178 lb. Latest models of all Homelite generators are illustrated in this bulletin.

NAILS NAILS AND MORE NAILS

MOST ALL SIZES ON HAND

Atlas Nail Co., Inc.

Phone ANdover 3-3068

20 N Wacker Drive Chicago 6, Ill.

NOTE: WE WILL BUY YOUR SURPLUS NAILS

save time between jobs with JAHN TILT TRAILERS

Tilt—load—and you're off in a matter of minutes with a Jahn Tilt Trailer. No jacks or loading ramps required. One-man operation. Positive, automatic safety lock holds platform in position when loaded or empty. Rubber mounted drawbar absorbs road shocks and protects both truck and trailer. Ideal for transporting tractors—rollers—compressors—shovel-loaders—mixers, etc. Jahn Tilt Trailers are available in 8 ton capacity tandem axle and 5 ton capacity single axle models. Write for specifications and illustrated bulletin or see your nearest Jahn distributor.

JAHN TRAILERS ALL OVER THE WORLD

C. R. JAHN COMPANY

Dept. 1345 —1106 W. 35th Street, Chicago 9, Illinois

Heavy duty trailers from 5 to 100 tons

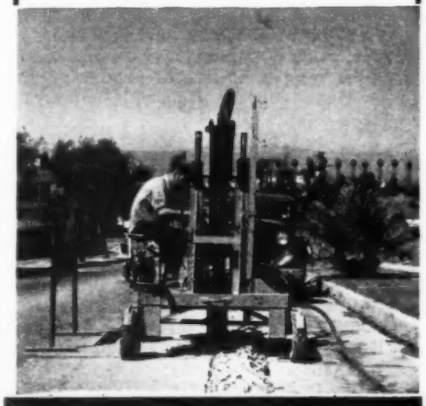
BREAK PAVEMENT

the low cost way!

By Using

THE MIGHTY MIDGET

Operator rides self-propelled machine and breaks 100 linear feet per hour of 18" trench opening in concrete pavement for 8 hours per day. Write for Bulletin and Dealer's name. (MM4-1)



R.P.B. CORPORATION

2751 EAST 11th STREET • LOS ANGELES, CALIFORNIA

32

Material Handling Equipment

Literature giving dimensions, specifications and important features of its new redesigned equipment has been issued by George Haiss Mfg. Co., Inc., division of Pettibone Mulliken Corp., 141st St., New York 51, N.Y. The equipment includes belt and drag type conveyors, and car unloaders, bucket loaders, clamshell buckets, package handling conveyors and sectional conveyors.

33

Concrete Placement

Facts on the modern placement of concrete through air entrainment are given in a booklet issued by Autolene Lubricants Co., Denver, Colo. The booklet explains what air entrainment is, what it does for the contractor, what it does for the concrete and what it costs. Chapter is also devoted to how to use air entrainment.

34

Belt Conveyors

A catalog on its belt conveyors produced by the New Holland Manufacturing Co., Mountville, Pa., contains pictures and diagrams showing the adaptability of the conveyors. Built in 8-, 12-, 16- and 20-ft. sections, these conveyors are also available in any combination of sections. Standard belt widths are 18, 24, and 30 in., with 36- and 42-in. widths available on special order. Six tables list information on capacity, horizontal horsepower requirements, etc.

Shunk Snow Plow and Ice Removal BLADES

Proved record of superior performance. Made of specially developed steel to withstand severe service conditions.

FOR ALL TYPES AND MODELS OF SNOW PLOWS

Various widths, lengths, thicknesses--flat or curved--standard or special--punched ready to fit your machine.

SHUNK SAW-TOOTH ICE BLADE

Amazingly effective. Thoroughly breaks up and removes heavy, slippery ice and snow formations. Replaces all types of snow plow blades or maintenance units. Write for Bulletin and name of nearest Distributor.

AEM

Shunk MANUFACTURING COMPANY

ESTABLISHED 1854

BUCYRUS, OHIO.

FOR A LEVEL RIDE

the La Crosse Oscillating Axle..

Here's the axle for loading problems, bumpy roads, uneven terrain.

- Full oscillation without strain on any part of the axle assembly.
- Full length axle, machine straightened, assures wheel alignment under all conditions of oscillation.
- Sufficient oscillation to permit one wheel to maneuver a 10" obstacle.

HEAVY DUTY **LA CROSSE** TRAILER CORPORATION

LA CROSSE, WISCONSIN

Dealers in all 48 States

A Few Tips on Tractor Winterization

(*Continued from page* 91)

8. Clean the mud and snow out of the tracks and truck wheels and from the support rollers before leaving the tractor at night. Then park it on solid ground to prevent it from freezing down. A lot of dirt and snow will fall off if you run it back and forth a few times in a cleared solid place.

If the tractor is to be operated in Arctic temperatures, consult your nearest authorized dealer or write the factory for information regarding availability of special cold weather equipment.

Aviation-Contractor Committee Meets Again

(*Continued from page* 74)

New York State Bureau of Aviation: Wm. C. Murray, E. T. Lynch, William G. Wood, and Walter Willetts.

CAA was represented by Edgar N. Smith, deputy assistant administrator; Paul Morris, director of CAA's airport operations division; and Paul Stafford, assistant director of airport engineering service.

William L. Hyland and Leroy P. Henderson, both of the Boston consulting firm of Fay, Spoffard & Thorndile, also took part.

Contractors present included: Max C. Harrison, Harrison Construction Co., Pittsburgh, Pa.; J. Warren Shoemaker, Warren Brothers Roads Co., Cambridge, Mass.; George C. Koss of the Des Moines firm of that name; Albert Adelman, Coleman Bros. Corp., Boston; and W. J. Slater, Stewart and Williams, Inc., Augusta, Me.

Contractors' representatives present were: Allan E. Gifford, executive secretary of the A.G.C. of Massachusetts; Harry J. Kirk, manager of research and safety division in the national office of the A.G.C., and A. N. Carter, manager of the highway division in the same office.

WITH THE MANUFACTURERS & DISTRIBUTORS

DeVries Joins Haiss

George Haiss Mfg. Co., Inc., New York City, division of Pettibone Mullikin Corp., Chicago, has announced the appointment of S. DeVries as exclusive sales representative for the new Haiss line of material-handling equipment in the state of Connecticut. Mr. DeVries' address is P.O. Box 31, Milldale, Conn. He has a background of more than 20 years of experience in sales, application and servicing of conveyors.

S. DeVries

W. H. Hammond Resigns

W. H. Hammond has resigned as vice president of sales of Gar Wood Industries, Inc., Wayne, Mich. After a brief vacation Mr. Hammond will assume a distributorship of the company's products. E. B. Hill, general sales manager, takes over overall responsibility for the sale and distributorship of the company's products.

Appointed Schramm Representative

B. R. Van Campen has been appointed district representative by Schramm, Inc., West Chester, Pa., with headquarters at Highland Bldg., 121 South Highland Ave., Pittsburgh, Pa. Mr. Van Campen has a sales engineering background that qualifies him to serve the best interests of the many Schramm compressor users in a territory comprising the western part of Pennsylvania, eastern part of Ohio, and the state of West Virginia.

B. R. Van Campen

Personnel Changes at Caterpillar

William Kusz, special representative since 1946, has been appointed supervisor of industrial advertising at Caterpillar Tractor Co., Peoria, Ill., according to an announcement by W. K. Cox, Advertising Manager. The new appointee has been associated with the heavy machinery business since 1940. He succeeds K. M. Emery, who has been promoted to supervisor of co-operative dealer advertising. Other personnel changes in the expanded advertising department name E. C. Chapman, earthmoving representative since 1946, supervisor of industrial motion pictures; L. L. Morgan, district representative since early 1947, supervisor of agricultural advertising; Fred V. Jacobs, assistant to the engine sales manager since 1946, supervisor of engine advertising; Robert Culshaw, community relations representative since 1944, supervisor of picture procurement.

Wm. Kusz

Buda Acquires Hebard Co.

The Buda Company, Harvey, Ill., has acquired the W. F. Hebard & Co., 336 West 37th St., Chicago, Ill., manufacturers of materials-handling equipment including "Shop Mule" tractors and lift trucks. W. F. Hebard & Co. will be operated as a wholly owned subsidiary of The Buda Company. The manufacturing of their present line of products will be continued at the Hebard Company.

New Gradall Distributors

E. H. Kliebenstein Co. and Tyler-Preusser, Inc., have been appointed distributors for Gradall, it is announced by S. F. Beatty, Jr., sales manager of the Gradall Division, The Warner & Swasey Co., Cleveland, O. The Kliebenstein Co. will handle sales and service for Northern New Jersey, from their headquarters at Hendricks Causeway, Ridgefield, N.J. Tyler-Preusser, Inc., Boston Post Road, Pelham Manor, N.Y., newly established firm of equipment specialists, will service the metropolitan New York, and Long Island area.

VULCAN PAVEMENT AND CLAY DIGGING TOOLS

ARE MADE in a complete line of sizes to fit all standard compressed air hammers.

Send for NEW Vulcan illustrated CATALOG today.

VULCAN TOOLS — THE WORLD OVER — NOTED FOR QUALITY AND DURABILITY

VULCAN TOOL MFG. CO.
QUINCY, MASS.

MOVE SNOW FASTER with Penn Drake
SNOW PLOW WAX
Brush or spray on moldboards and wings. Used by 1300 highway dep'ts.
At your dealer or
PENNSYLVANIA REFINING CO.
2800 Lisbon Rd. • Cleveland 4, Ohio

TRANSITS and LEVELS
HEADQUARTERS for REPAIRS — any make

We will buy or trade in old Transits, Levels, Alidades, etc. Send instruments for valuation.

Write for new Catalogue RS-411, of Engineering Instruments, Engineering Field Equipment and Drafting Room Supplies.

WARREN-KNIGHT CO.
Mfgrs. of Sterling Transits & Levels
136 N. 12th St. • Philadelphia, Pa.

CLEARING HOUSE

NEW WHITE HALFTRACKS

Originally cost gov't $7,000. Now priced at such a very small fraction of that figure. With White 160AX motor, 4-speed trans. with auxiliary 2-speed shift and super power low speed drive. Hydraulic brakes, 900x20 tires. Excellent for logging, skidding, construction work, house moving, dump work. Available with or without winches. We carry a full line of replacement parts.

1,000,000's of G.I. Truck Parts.

Mail Orders Filled.
Write. Phone. Come in.

Wilensky Auto Parts Co.

1226-28 Washington Ave. N.
MINNEAPOLIS, MINN.

AT. 4438 NE. 3758

FOR SALE

1946—10 yd. Anthony dump trailer	$1000.00
1946—5 yd. Anthony dump box	$500.00
W. K. 125 H.P. Waukesha motor & pulley	$500.00
½ yd. "Caterpillar" bucket loader	$500.00
2—1½ yd. Transit Concrete Mixers Each (Will also mix 1 yd. mortar)	$350.00
Adams 102 motor grader—12' blade	$400.00
Gilson #16 pulverizer—completely rebuilt	$500.00
10 Ton Little Giant Tandem Axle for Ford Truck	$150.00
Stover 7" x 12" pulverizer	$300.00

E. C. KOLPAK

Phone 919-2 Oregon, Illinois

FOR SALE

34E Foote Paver, Serial #49042

Blaw-Knox Gas Electric Finisher 18 to 22'. Bargain

Jaeger Finsher-Spreader, Ser. #130

Collignon Construction Co., Davenport, Iowa

910 Kahl Bldg.

FOR SALE

Will Sacrifice For
QUICK SALE

1—Model 12 Buckeye pipeline ditcher with Buda gasoline motor. New, late 1947. In A-1 condition. Price $7,500.00

1—Bucyrus-Erie 10B with dragline and backhoe, Buda motor.

Equipment 6 months old and in A-1 condition. Price $7,500.00

Subject to prior sale. These machines too small for our future work.

WIRE—WRITE—PHONE

L. WALKER FAUBER

Phone: Main 153 Ashland, Ohio

1 No. 35 Caterpillar with Dozer and extra set of Tracks.
1 No. RD8 Caterpillar with Angle Dozer.
1 No. 65 Caterpillar with Dozer. Adams 51 Patrol.
1 1½ yard Gas Air Shovel.
1 Crushing Plant on Pneumatic Tires. 9 x 36 Pioneer Crusher, 18 x 30 Roll Crusher. 3 ft. x 10 ft. Shaker Screen.
2 Oil Distributors.
1 Sand Spreader, small. Set of Rolls 14" x 22".
1 2-Deck 4 ft. x 8 ft. Niagara Screen.
1 Shovel Bucket for 37B Shovel.

TAYLOR & TAYLOR, Inc.
307 Providence Bldg.
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TRANSITS—LEVELS

IMMEDIATE SERVICE

Over 30 Years Repairing All Makes of
TRANSITS & LEVELS

Guaranteed Work by Experts
Will send you shipping case for your instrument. Advise us.

New and Used Instruments in Stock

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L. Z. HOWELL COMPANY, INC.

Construction Equipment Headquarters
Rentals — Sales — Service — Parts
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Phone: CAlumet 5-1612

2—Wooldridge, 200 H. P. diesel, Terra Cobra, New
1—Wooldridge Model TCH scraper, 24 to 28 cu. yd. capacity. Used one month
2—Wooldridge Model TCN scrapers 15½ to 19 cu. yd. capacity, New
1—Wooldridge scraper, 8 to 11 cu. yd. New
1—Wooldridge scraper, 11 to 14 cu. yd. New
1—Wooldridge Model BBM scraper 6 to 8 cu. yd.
1—Wooldridge ripper, New
1—North Western combination bulldozer and ripper, suitable for D7 or D8 Tractor
1—Used Link-Belt Speeder, Model K580, crane with 70 ft. boom, two 20 ft. extensions, "Catapillar" diesel D17000 engine, 36" wide track pads, high gantry with Speed-O-Matic controls.
1—Used Link-Belt Speeder, Model K535, dragline with 80 ft. boom, Waukesha NKH oil engine, 40" wide track pads, 18" Catwalk, two 2½ cu. yd. Page buckets.
1—Used Northwest Model 80 combination shovel and dragline, Twin-City oil engine, 36" wide track pads.
1—Used Lima #1201 combination shovel and dragline
1—New HD5 Allis-Chalmers bulldozer
1—Used Hobart gas engine driven welder
1—1945 Ford Truck with dump bed

Special to Close Out

540 feet of 24" Rubber belting, 4 ply —New

Miscellaneous New and Used Pumps of Various Sizes and Types.

ADVANCE CONTRACTORS SUPPLY CO.

REX MIXERS AND EQUIPMENT

Compressors, Pumps, Hoists, Saws, Wheelbarrows, Vibrators, etc.

NEW AND USED
Rental - Sales - Service

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Haymarket 4270

TRUCK PARTS

We Carry the Most Complete Line of New and Used Truck Parts and Equipment in the Northwest.

Transmissions	Dump Bodies	Carburetors
Rear Ends	Hoists	Magnetos
Complete Motors	Hoist Parts	Bearings
Differentials	Axle Shafts	Trailers
Housings	Universal Joints	Gears
Springs	Truck Chassis	Wheels

Come in and see the Largest Stock of Used Trucks in this part of the country.
We also carry a complete line of Passenger Car Parts.

WILENSKY AUTO PARTS CO.
1226 Washington Av., N. Phone At. 4438, Minneapolis

ANDERSON EQUIPMENT CO.

Merchants National Bank Building
13th and Farnham Streets
OMAHA 2, NEBRASKA

FOR SALE

Used Contractors Equipment, Subject To Prior Sale

1—Blaw-Knox Clamshell Bucket, 1¼ cu. yd., wide Barge Type. First Class.

1—Page ½ cu. yd. Dragline Bucket, Type RH. Good.

1—International pneumatic tired Tractor, Model I-9. Good condition.

1—Bros Giant Sheepsfoot Roller, G2. Dual drums, like new.

1—Adams Heavy Duty Road Ripper. Good condition.

1—Jaeger Concrete Spreader. Adjustable 20' to 22', new 1942. Good condition.

1—Insley Dragline ⅜ cu. yd. Model K10, Serial No. 178, equipped with 30' boom. With an Insley Trailer and a ⅜ cu. yd. dragline bucket.

1—Williams 2 cu. yd. Dragline Bucket, Model GP1. Fully equipped. Completely overhauled.

1—Page 2 cu. yd. Dragline Bucket, Model R. C. Automatic, fully equipped.

1—Jahn 22 Ton Single Purpose Trailer, Model 622T. Equipped for hauling 15B Bucyrus, 25 Northwest or 304 Koehring. Brakes are mechanical. Never been used.

1—Buckeye Spreader Box, 10 foot, Model 10S, on steel wheels, overhauled.

1—Carr Form Grader—A36, overhauled.

1—5 Ton, 3 Wheel Huber Roller, overhauled, good condition.

1—5" Deming Single Stage Centrifugal Pump, gas engine driven, mounted on pneumatic tires.

1—4C Dumpcrete, nearly new.

1—Gorman Rupp Road Pump, Model R100, good condition.

1—28S Koehring Stationary Mixer, Electric Motor driven. Complete with charging hopper. Recently overhauled with new liners, drip rings, buckets and discharge chute—excellent condition.

1—5 K. W. Le Roi Light Plant. A. C. Model, 5AD91P. Good as new.

1—125 H. P. Broderick Boiler. Carries Hartford and Nebraska State certificates to work at 175 lbs. pressure. Recently reflued. Oil fired, and completely equipped with oil burner accessories.

1—½ yd. Model 514 Unit shovel, gasoline driven, New 1942 .....$5,750.00

1—Model 255A P&H ¾ yd. Shovel, gasoline driven with dragline attachment, New November 1946 .....$11,000.00

1—315 cu. ft. LeRoi Air Compressor, gasoline driven on 4 pneumatic wheels, New August 1946 .....$4,000.00

1—Model "H" Junior Rapid Paving Breaker, New August 1946, used 2 weeks $2,750.00

3—LeTourneau Super C Scrapers, less than 1 year old, used 3 months, $17,000.00 each.

1—Diamond Vibrator, 3x10 double deck, New.....$1,200.00

1—24" Samuel No. 44 double surfacer Triumph Planer, New $2,100.00

1—"UTI" Minneapolis Moline industrial Tractor, New 1947..$4,000.00

1—"UTI" Minneapolis Moline Industrial Tractor with Lull 2D Loader, New 1947.....$3,900.00

1—C114 La Plant-Choate Scraper, New 1947 .....$6,000.00

1—Marvel Spray Machine, TJ200 gal., New 1948 .....$640.00

The Chesapeake Supply & Equip. Co.
1211-13 E. 25th St., Baltimore 18, Md.

LIQUIDATION SALE

Link-Belt Crane K2 No. 1099	$4,500.00
Osgood Crane Victor No. 2542	9,000.00
Multifoote Paver 34E, new	18,000.00
Allis-Chalmers power grader, new	9,500.00
1—Huber tandem roller, 10-ton	1,000.00
1—Austin tandem roller, 7½-ton	1,000.00
1—Fordson Pup roller, 5-ton	1,000.00
1—Stiff Leg Derrick, 50-ft. boom	800.00
1—Cummings Pug Mill	3,000.00

Other miscellaneous paving equipment.

Phone: DEarborn 2-3210

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33 NORTH LaSALLE STREET
CHICAGO 2, ILLINOIS

FOR SALE

1—Venn-Severin diesel, standard four cyl. 300 H.P. 14½"x16½" 200 K.W. flywheel generator, mufflers, switchboard, panels, and control equipment.
Price F.O.B. our quarry.....$13,500
Must be seen to appreciate.

1—Muncie Type No. V-33-107 oil engine, General Electric Alternating current generator, complete with panels and control equipment.
Price F.O.B. our quarry.....$5,500

1—P.D. 80 International diesel engine with new crank shaft and main bearings. Very good.
Price F.O.B. our quarry.....$1,300

1—Alternating current generator & excitor # F301091. Type A. T. B. 8-75-900 Speed. P.F. 1.00, Amps 100 & K.W. 100, V-belt driven, belts and chevies. New. Switchboards, controls & accessories. Generator can be pulled by P.D. 80.
Price F.O.B. our quarry.....$1,500

LAMAR STONE COMPANY
Princeville Illinois
Phone: Edelstein 25 or Princeville 71

FOR SALE

Now operating—Less than one year old.

1—30"x42" Diamond Jaw Crusher
1—4'x12' 3-Deck Vibrating Screens
1—36"x20" Apron Feeder
1—Hopper for Apron Feeder
1—40"x22" Roll Crusher
1—30"x12" Belt Conveyor Channel Frame
1—Drive to tail shaft (30"x125' Conveyor)
1—30"x125' Belt Conveyor, Lattice Frame
1—24"x175' Belt Conveyor
1—Motor Mounting
1—24"x40' Belt Conveyor
1—Motor Mounting
1—V-Belt Drive for 30" Head Pulley
2—V-Belt Drives for 4'x12" Screens
3—35 cu. yds. Bins with Jack legs

All Diamond Equipment in excellent condition practically new—located in Georgia—near Atlanta.

J. B. HUNT & SONS (INC.)
Telephone 23919
Raleigh, North Carolina

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County Road Commissions, Cities, and Towns in the Snow Belt

3 — New Bros Rotary Snow Plows, mounted on FWD trucks — complete unit brand new, at less than half of current prices. Snow loading chutes available.

GOVERNMENT SURPLUS

Write, wire, or telephone for prices and specifications.

STRAITS ENGINEERING COMPANY
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One Northwest ¾ Yard Crane, Model No. 2 Serial No. 3742.

One Osgood 1½ Yard Victor Shovel, Serial No. 2864.

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1 Blaw-Knox Finishing Machine 2,500.00
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2 Model 20XBHS each @ 2,000.00
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Adams 51 Diesel Motor Patrol	750.00
Le Tourneau Model G	1,250.00
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1 Northwest model 25 shovel front with new drum	1300.00
1 Northwest model 6 backhoe w/o bucket	2500.00
1 Northwest model 25 shovel front w/o boom sheaves and pin	800.00
1 Northwest model 25 shovel front	900.00
1 Northwest model 6 shovel boom only	1000.00
1 Northwest model 80-D shovel boom only	1500.00
1 Northwest model 6 shovel boom only	1000.00
1 Northwest model 6 shovel boom only	1000.00
1 Northwest model 6 crane boom 55-foot, new	900.00
1 Northwest model 6, 78-D, 80-D boom head, 21-feet	250.00
1 Northwest model 6, 78-D, 80-D boom head, 21-feet	250.00
1 Northwest model 6, 78-D, 80-D boom head, 21-feet	250.00

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3—Wooldridge Terra Cobras with all the improvements, in very good working condition.

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New 105 Davy Portable Compressors.

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80′ Boom 15′ Jib

LORAIN 40 DIESEL CRAWLER
Crane, Dragline, Shovel, Backhoe

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Hydraulic Blade Double Drum, P.C.U.

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Sullivan wagon drill, new condition.

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1—Allis-Chalmers "K" Tractor
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- 1 Bins and Hoppers
- 2 Conveyors
- 3 Crushers
- 4 Portable Plants
- 5 Screens

II BITUMINOUS:
- 6 Batchers
- 7 Finishers
- 8 Distributors
- 9 Dryers
- 10 Heaters
- 11 Plants (central)
- 12 Plants (travel)

III CONCRETE:
- 13 Batchers
- 14 Buggies and Carts
- 15 Finishers
- 16 Joints, Expansion and Contraction
- 17 Mixers (under 1 yd.)
- 18 Mixers (1 yd. up)
- 19 Pavers
- 20 Reinforcing Steel
- 21 Road Forms (1000' set)
- 22 Tower
- 23 Truck Mixers

IV CRANES:
- 24 Crawler Mounted
- 25 Truck Mounted
- 26 Piledrivers

V GRADERS:
- 27 Blade, self propelled
- 28 Blade, pull type
- 29 Blade, under truck
- 30 Elevating

VI LOADERS AND TRENCHERS:
- 31 Front-end loader (tractor mounted)
- 32 Loader, bucket type and belt type
- 33 Trencher or Ditcher

VII HAULING EQUIPMENT:
- 34 Dump Truck
- 35 Other Trucks
- 36 Dump Wagons, tractor drawn
- 37 Flatbed Trailers

VIII PUMPS:
- 38 Centrifugal
- 39 Diaphragm
- 40 Piston

IX POWER UNIT: (Independent)
- 41 Gasoline
- 42 Diesel
- 43 Electric

X ROLLERS:
- 44 Power (Smooth)
- 45 Pneumatic Tire
- 46 Sheepsfoot

XI TRACTORS:
- 47 Crawler
- 48 Rubber Tired

XII TRACTOR EQUIPMENT:
- 49 Bulldozers
- 50 Power Control Units
- 51 Rippers
- 52 Scrapers, tractor drawn
- 53 Scrapers, self-powered

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- 54 Clamshell
- 55 Concrete
- 56 Dragline
- 57 Orange Peel

XIV SHOVELS AND DRAGLINE:
- 58 Crawler (under 1 yd.)
- 59 Crawler (1 yd. up)
- 60 Truck Mounted

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- 84 Hydraulic Control Equipment
- 85 Hand Tools
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- 89 Snowplows, v or wing

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Name of your company or governmental department .....

Type of work for which equipment will be used .....

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Turns freely with the hose under all conditions—the result of an entirely new principle of design and construction. Requires no lubrication or adjustment. For end or intermediate connections. Adaptable to other standard hose couplings. Leakproof under all normal working pressures. Made in cadmium plated steel, in ½" and ¾" I.P.T. sizes.

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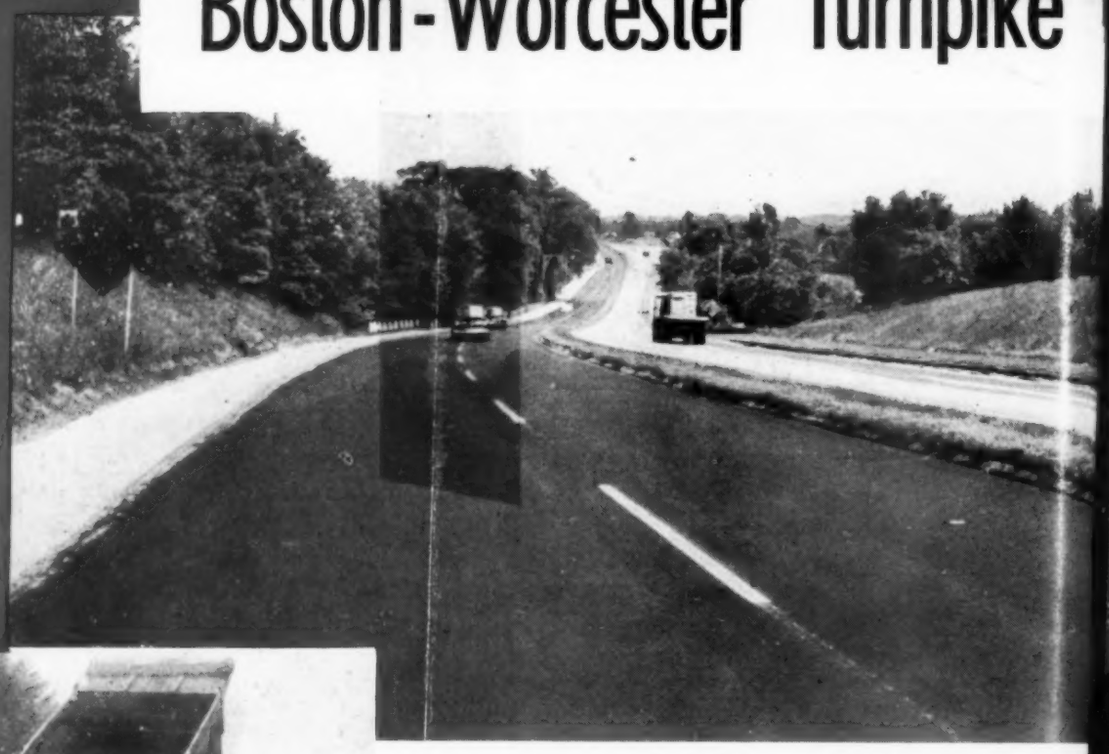
Massachusetts lays Texaco Asphaltic Concrete on another *major American highway*

Boston-Worcester Turnpike



(large photo) Resilient, joint-free Texaco Asphaltic Concrete on left side of Turnpike; old pavement, about to be re-surfaced on the other side.

(small photos) First and second courses of new Texaco Asphaltic Concrete surface, being laid by National Contractors Company, Inc., Somerville, Mass.

The Boston-Worcester Turnpike is, without doubt, one of the country's major highways. It connects the two largest cities of Massachusetts. Moreover, it carries much of the motor freight traffic moving between New York City and Boston.

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